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STATUS OF ATLANTIC SALMON IN THE RESTIGOUCHE RIVER IN 1997

by

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Abstract

An angling-based assessment assuming 30-50% exploitation indicated that egg deposition and large salmon spawning escapement were about 35-65% of the conservation requirement for the Restigouche River. Visual counts estimate that large salmon escapement was approximately 40-50% of requirement and support the conclusion of the angling-based assessment that small salmon spawning escapement was in excess of the requirement. All indices of abundance indicated that returns to the river were low in 1997. Returns to counting fences on the Matapedia and Upsalquitch rivers were 36-38% below the five-year mean return of large salmon but only 5% (Upsalquitch River) below the mean of small salmon. Total returns of large salmon to the river did not exceed the conservation requirement.

Estimated returns by the angling catch-based method were 7,400-11,700 large and 7,900-13,200 small salmon. By a combination of the visual methods, returns were conservatively estimated at a minimum of 7,300 large and 6,000 small salmon. Angling catches (retained+released) were 2,649 large and 3,408 small salmon. Retained angling harvests were 729 large and 3,079 small salmon. New Brunswick First Nations harvest was at least 166 large and 26 small salmon. Québec First Nation harvest was unknown but was estimated as 985 large and 18 small salmon.

Based on a significant historical correlation of small salmon returns in year x to large salmon returns in year x+1 in the Matapedia River, and on the basis of average small salmon returns to the Restigouche River in 1997, there may be an expectation of average 2-sea-winter salmon returns in 1998. However, this expectation must be regarded with caution given the low returns of large salmon in the Restigouche system in 1997.

Densities of juvenile age classes, determined by electrofishing, were 7-29% above the five-year means.

Conservation requirements and stock assessments of the five major tributaries of the Restigouche system are presented here for the first time. According to visual surveys by divers, none of the stocks achieved egg deposition at the level of 2.4 eggs/m^2. Egg depositions of the Little Main Restigouche and Matapedia stocks were estimated at 84-86% of the conservation requirement. Kedgwick, Upsalquitch and Patapedia egg depositions were estimated at from a bit under half to about three quarters (43-73%) of the requirement. This estimate may be overly conservative for the Patapedia and Upsalquitch because of incomplete spatial coverage by the surveys in these rivers.

Large salmon returns in excess of spawning escapement requirements occurred only in the Matapedia River. Small salmon returns to all the tributaries were in excess of spawning escapement requirements.

Résumé

Une évaluation fondée sur les données de la pêche récréative à un taux d'exploitation présumé de 30 à 50 % indique que la ponte et l'échappée de gros saumons satisfaisaient entre 35 et 65 % des besoins de conservation pour la rivière Ristigouche. Les dénombrements situent l'échappée estimative de gros saumons comme correspondant à environ 40 à 50 % des besoins et étayent la conclusion de l'évaluation fondée sur la pêche récréative à l'effet que l'échappée de petits saumons dans la rivière était faible en 1997. Les remontées observées aux barrières de dénombrement des rivières Matapédia et Upsalquitch étaient de 36 à 38 % inférieures à la remontée moyenne quinquennale de gros saumons, mais de seulement 5 % (rivière Upsalquitch) inférieure à la remontée moyenne de petits saumons. Les remontées totales de gros saumons dans la rivière n'étaient pas supérieures aux besoins de conservation.

Les remontées estimées selon la méthode des prises récréatives atteignaient entre 7 400 et 11 700 gros saumons et entre 7 900 et 13 200 petits saumons. Une combinaison des méthodes d'observation visuelle donne une estimation prudente d'un minimum de 7 300 gros saumons et de 6 000 petits saumons. Les prises récréatives (saumons conservés + saumons remis à l'eau) se situaient à 2 629 gros saumons et 3 408 petits saumons. Les prises gardées se composaient de 729 gros saumons et de 3 079 petits saumons. Les Premières nations du Nouveau-Brunswick ont capturé au moins 166 gros saumons et 26 petits saumons. Les prises des Premières nations du Québec sont inconnues, mais elles sont estimées comme se situant à 985 gros saumons et 18 petits saumons.

D'après une étroite corrélation historique entre les remontées de petits saumons dans l'année x et les remontées de gros saumons dans l'année x + 1 dans la rivière Matapédia et étant donné que les remontées moyennes de petits saumons dans la rivière Ristigouche en 1997 étaient dans la moyenne, on pourrait s'attendre à des remontées moyennes de saumon dibermarin en 1998. On ne doit toutefois pas donner trop de poids à cette attente étant donné les faibles remontées de gros saumons dans le réseau de la Ristigouche en 1997.

Les densités des juvéniles selon les classes d'âge, déterminées par pêche électrique, étaient de 7 à 29 % supérieures aux moyennes quinquennales.

Les besoins de conservation et les évaluations des stocks des cinq principaux tributaires du réseau de la Ristigouche sont présentés pour la première fois. Selon des relevés visuels effectués par plongée, aucun des stocks n'a réalisé une ponte à 2,4 oeufs/m2. La ponte chez les stocks de la Petite Ristigouche principale et de la Matapédia a été estimée comme se situant à entre un peu moins de la moitié à environ trois quarts (43-73 %) des besoins. Cette estimation peut être trop prudente dans le cas des rivières Patapédia et Upsalquitch car la couverture spatiale des relevés de ces cours d'eau était incomplète.

Les remontées de gros saumons excédentaires aux besoins de l'échappée ne se sont manifestées que dans la rivière Matapédia, tandis que les remontées de petits saumons dans tous les tributaires dépassaient les besoins de l'échappée.

1 - Introduction

The objective of this report is to evaluate the status of Atlantic salmon in the Restigouche River system in 1997. Numbers of spawners in the entire system are estimated from (1) angling data and exploitation rates estimated to represent lower and upper limits, and (2) visual surveys of spawners. New to this stock assessment are tributary-specific assessments and conservation requirements for the five major tributaries of the Restigouche.

In the terminology of this report, small salmon are adults less than 63 cm in fork length, which are comprised mainly of 1SW (one-sea-winter or grilse) maiden salmon. Large salmon (also known as MSW or multi-sea-winter salmon) are adults greater than or equal to 63 cm in fork length. This category contains mainly maiden 2SW and 3SW fish and previous spawners.

2 - Conservation requirements

The egg deposition requirement for conservation of Atlantic salmon in the Restigouche River system is based on a recommendation for 2.4 eggs/m^2 of accessible habitat (Elson 1975). Habitat is estimated as 29.8 x 10^6 m^2 and therefore the requirement is 71,443,200 eggs (Randall 1984). Biological characteristics of salmon sampled in the estuary of the Restigouche River indicate that approximately 12,200 large salmon are required to produce these eggs. An additional 2,600 small salmon are required to ensure a 1:1 sex ratio at spawning (Randall 1984).

A new feature of this stock assessment is the calculation of conservation requirements for each of five major tributaries: the Kedgwick, Little Main Restigouche, Patapedia, Upsalquitch and Matapedia rivers (Table 1). Methodology followed Randall (1984), but biological characteristics specific to the stock of each tributary were used. Conservation requirements were not determined for the Main Restigouche River because biological characteristics specific to salmon which spawn in the main stem have not been measured. Tributary-specific conservation requirements, at a recommended egg deposition rate of 2.4 eggs/m^2, were as follows:

Tributary	Accessible habitat ($x10^6m^2$)	Eggs ($x10^6$)	Large salmon	Small salmon
Kedgwick	2.872	6.89	933	305
Little Main Restigouche	2.243	5.38	984	220
Patapedia	1.486	3.57	622	131
Upsalquitch	4.205	10.09	1839	970
Matapedia	6.811	16.35	2395	504

MEF has its own requirements for the Matapedia River and the Québec and New Brunswick (main stem) portions of the Patapedia River at a recommended egg deposition rate of 1.68 eggs/m^2 of accessible habitat: these are 11.44 million and 2.33 million eggs, respectively. The use of 1.68 eggs/m^2 is equivalent to considering 70% of the accessible habitat to be rearing habitat, at an egg deposition rate of 2.4 eggs/m^2 (F. Caron, MEF, pers. comm.).

3 - Restigouche system

3.1 - Description of fisheries

Restigouche salmon were fished by recreational anglers and First Nation communities.

Recreational angling was permitted in all tributaries and the main stem from June 1 to September 30 (except for Québec waters of the Patapedia River, where the season closed August 31). In addition, part of the Causapscal River and all New Brunswick and boundary waters were opened from May 15-31 for hook-and-release angling only (other than the Causapscal River, where fish were retained). Similar restrictions (which, in the Matapedia River, involved only large fish) applied to waters open to angling during September (except for Québec waters of the Kedgwick River, where retention was permitted). The Upsalquitch River was closed to all harvests from September 10 because of conservation concerns.

Anglers in New Brunswick tributaries and provincial boundary waters were required to release all large salmon. Catches of small salmon by New Brunswick license holders were restricted by seasonal (eight fish) and daily (two fish) bag limits. New Brunswick license holders angling in provincial boundary waters were regulated by Québec seasonal (seven fish) and daily (one fish) bag limits. However, for all intents and purposes the daily bag limit for New Brunswick anglers in provincial boundary waters was two small salmon, since Québec regulations permitted retention of a second salmon when the first fish caught in a day was a small salmon. Anglers licensed in Québec and fishing in Québec tributaries were allowed to retain both small and large salmon up to the daily and seasonal bag limits; if the first fish caught in a day was a small salmon, a second salmon of any size could be caught and retained.

Most salmon captured by First Nations fisheries were gillnetted in the estuary, although some angling also took place in freshwater portions of the river, primarily the Upsalquitch system. Gillnet fisheries were centred at Listuguj First Nation at Ristigouche, Québec, and at Eel River Bar First Nation near Dalhousie, N.B. (Fig. 1). No food-fishery trapnets were operated.

Eel River Bar First Nation's target harvest was set at 500 large and 50 small salmon to be harvested from Chaleur Bay, Crown Open waters of the Restigouche system, Benjamin River, Charlo River, Jacquet River and/or Eel River. The estuarine (Chaleur Bay) component of this harvest could be taken using up to 30 gillnets, each up to 400' in length, and up to three trapnets, during the season May 25-December 31. Salmon were to be removed from other areas by angling only during the season June 1-December 31. Jigging was specifically excluded from this agreement. The gillnet fishery was carried out from mid-June to late July (Table 2), and the freshwater angling fishery occurred through the summer and autumn.

There was no harvest target for Listuguj First Nation. The fishing season agreed upon with the Québec government was June 6-July 22. In the interests of conservation, gillnet fishing was limited to five nights/week (allowing unobstructed passage of fish from 8 A.M. on Monday to 4

P.M. on Wednesday) and an area of the upper estuary immediately below the mouth of the river was designated as a conservation zone where gillnetting was not permitted.

Madawaska Maliseet First Nation fished upriver with a target harvest of 60 large and 190 small salmon to be taken from specified portions of the St. John, Green and Restigouche (Crown Open waters of the Main Restigouche, Kedgwick and Gounamitz rivers) watersheds. Angling was the only authorized means of harvest. This license covered April 25, 1997 to March 31, 1998.

The New Brunswick Aboriginal Peoples Council received a communal license with an allocation of 45 small salmon. These salmon were to be taken by angling only, from the waters of the Upsalquitch, Charlo, Benjamin and Jacquet rivers during August 1 through October 31; and from the waters of the Restigouche River (from the confluence of the Restigouche and Matapedia rivers for a distance of approximately 10 km upstream) during August 1 through September 15.

Pabineau First Nation received a communal license for 50 large and 40 small salmon, to be taken from the Upsalquitch, Charlo and/or Benjamin rivers from July 10 to December 31, 1997 and 10 small salmon, to be taken from the Jacquet River from June 3 to December 31, 1997.

Commercial salmon fisheries in Chaleur Bay have been closed in Québec since 1984, and in New Brunswick since 1985. Commercial fisheries in both provinces were prohibited from landing salmon caught in non-salmon fishing gear (by-catch).

3.2 - Fishery data

Fishery data were obtained from the sources listed in Appendix 6 of Claytor et al. (1994). No data were obtained from Listuguj First Nation in 1997, so the mean estuarine catch in 1989-1993 (the five most recent years for which data were available) was used as an estimate of harvest, as was also necessary in 1994-1996. It was assumed that there was no freshwater component to the Listuguj salmon harvest. The salmon harvest of Eel River Bar First Nation was subdivided into estuarine and freshwater components (R. Simonson, ERBFN councilor, pers. comm.). There was no harvest by Madawaska First Nation (F. Bernard, MMFN chief, pers. comm.) or N.B. Aboriginal Peoples Council (P. Fraser, NBAPC, pers. comm.). No data were obtained regarding Pabineau First Nation harvests.

Angling harvests (i.e., retained fish) were 729 large (Québec only) and 3,079 small salmon (Québec and New Brunswick combined) (Table 3). New Brunswick Aboriginal harvest was at least 166 large and 26 small salmon. Québec First Nation harvest was unknown but is assumed to be 985 large and 18 small salmon.

Angling catches were lower in 1997 than in 1996 (Table 4, Fig. 2). Small salmon angling catch was 5% lower than the five-year mean, but large salmon catch was 22% lower than the mean.

Large salmon catch per unit effort (CPUE) in 1997 was 26% lower than the five-year mean (Table 5). Small salmon CPUE was 14% lower than the mean.

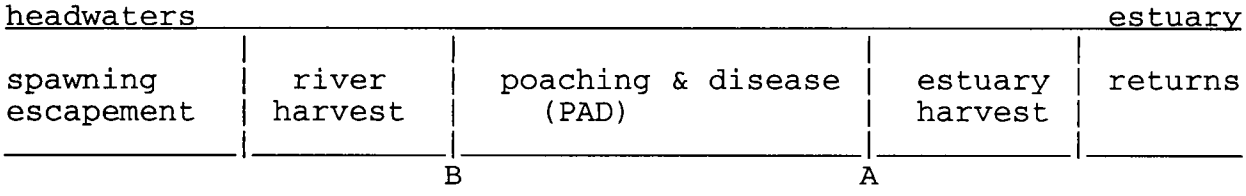
Landings by New Brunswick Aboriginal communities were at least 26 small salmon and 166 large salmon, which were reported by Eel River Bar First Nation (Table 6). Madawaska Maliseet First Nation reported a catch of 0 salmon. Other aboriginal communities licensed to fish the Restigouche system did not report catch. Trends in Listuguj First Nation landings could not be determined; the estimated catch was 18 small and 985 large salmon. **Recommendation:** Harvest data is required from all fisheries; in particular, the salmon harvest of Listuguj First Nation evidently represents a large component of removals from this river, but these data have not been provided since 1993.

Total reported and estimated landings of salmon in the Restigouche system in 1997 were 5003 fish (Table 7).

3.3 - Angling-based estimate of stock status

Total returns were considered to be the sum of estuary harvest, river harvest, poaching and disease (PAD) removals, and spawning escapement.

Returns = Estuary harvest + PAD + River harvest + Escapement



Estuary harvest is First Nations harvest.

An adjustment for mortality resulting from poaching and disease is normally excluded from calculations of spawning escapement in other rivers since the conservation requirement of 2.4 eggs/m^2 takes this source of mortality into account. It has been retained in the assessment for the Restigouche River since in this system poaching and disease occurs prior to or at the same time as in-river removals and thus must be added to these to estimate returns.

The poaching and disease (PAD) mortality rate was assumed to be 0.14 of the population entering the river (i.e. after estuary harvest, but before angling) for small salmon and 0.16 for large salmon, as in previous assessments (Randall et al. 1988). The calculation was made as follows:

For large salmon, **PAD = 0.16[B/0.84]** because,

PAD = 16% of the population at point A and,

The population at point A = B + 0.16 A
= B/0.84

B, the population available to anglers = angling catch/exploitation rate
B = Catch/Exp

Therefore, **PAD = 0.16[(Catch/Exp)/0.84]**

By similar logic, PAD for small salmon was calculated as:

PAD = 0.14[(Catch/Exp)/0.86]

River harvest for small fish is the sum of fish lost to angling (including mortality associated with catch-and-release), broodstock collection and First Nations river removals. The mortality associated with catch-and-release of small salmon was assumed to be 6%, the same as large salmon (Courtenay et al. 1991).

River harvest for large fish is the sum of fish lost to angling (Québec), mortality associated with catch and release (N.B., mainly), broodstock collection and First Nations river removals.

Spawning escapement was calculated as angling catch divided by angling exploitation rate minus river harvest. Angling exploitation rate is unknown for the Restigouche River, but Randall et al. (1990) argued that it is probably somewhere between 0.3 and 0.5. Therefore, spawning escapements were calculated for these limits.

Returns were estimated as 7,447-11,652 large (Tables 8, 9) and 7,944-13,227 small (Tables 10, 11) salmon. The ranges reflect the difference in the estimates when exploitation rate is set to 0.3 or 0.5. Spawning escapement was calculated as 4,317-7,849 large and 3,691-8,235 small salmon (Figs. 3, 4).

3.4 - Pre-spawner surveys (snorkel)

3.4.1 - Abundance estimates

Snorkelling counts were carried out by MEF/LFN in the Matapedia and Patapedia rivers, and by DFO/DNRE in the Kedgwick, Little Main Restigouche and Upsalquitch rivers. Spot surveys only were carried out in the Main Restigouche River. The method used varied with river size and water clarity. For the most part, observations were made by divers, but when conditions allowed (clear water, weak current), some counts were conducted from canoes. Counts were made just before the spawning season when salmon were still concentrated in pools.

The MEF/LFN divers provided a single count for each tributary. In small tributaries such as the upper Patapedia and Causapscal rivers, one diver drifted downriver counting all salmon. In intermediate-size tributaries (e.g. the lower reaches of the Patapedia River), the team included a

diver and a canoeist. The canoe preceded the diver downriver, so as to funnel salmon towards the diver, who was responsible for counting. In large and deep rivers, such as the Matapedia River, two divers and a canoeist worked as a team, funnelling fish towards the second diver. As they drifted downriver, the first diver was responsible for counting fish passing between himself and the canoe. The second diver counted all other fish.

The DFO/DNRE divers provided replicate counts for most of the stretches surveyed so that observer variability could be examined. A team of two divers accompanied by a canoeist surveyed each section. Each diver drifted through each of the pools one or more times in order to obtain the best possible count of salmon in the time available. The total number of fish in the area counted was determined based on individual counts (where there was substantial difference in experience levels of the divers, the count of the more experienced diver was usually selected unless some other factor affected the relative quality of the two counts) or counts averaged over the two observers (where experience was reasonably similar). The methods by which the total count was obtained were determined after consultation with each team of divers and are documented on a case-by-case basis in Appendix 1. Similar results were obtained from a randomization routine which randomly selected counts from one or the other diver (Appendix 2).

Areas and dates covered by the MEF/LFN survey were:

- Kedgwick R.: N. Branch (Quigley Brook to Falaise Pool) - Oct. 8
- Patapedia R.: main stem (Forks to 2 Mile) - Oct. 17
- Matapedia R.: above Forks (including Humqui R.) - Oct. 11 & 19, main stem (Forks to Matapedia) - Sept. 23-24

Areas and dates covered by the DFO/DNRE survey were:

- Kedgwick R.: N. Branch (Gin Creek to mouth), S. Branch (Union Brook to mouth), entire main stem - Oct. 7-9
- Little Main Restigouche R.: Boston Brook counting fence to mouth - Oct. 9
- Upsalquitch R.: Northwest Upsalquitch (10 Mile barrier fence to mouth), entire main stem. Spot-checked Southeast Upsalquitch (Shelter Pool to Southeast Falls) - Oct. 15-17
- Main Restigouche R.: Spot-checked (Junction to Down's Gulch - Oct. 8; mouth of Upsalquitch R. to Rafting Ground - Oct. 10)

A conservative estimate of abundance of spawners in 1997 is 4,677 large and 2,733 small salmon (4,501 large and 2,650 small, Table 12a; plus 176 large and 83 small, Main Restigouche R. spot-checks). This estimate is conservative because it excludes much of the Main Restigouche River, and, although fish were within a week of spawning at the time of the survey, migration into the tributaries may not have been completed. Counts were not adjusted to attempt to account for possible underestimation of fish by this method.

3.4.2 - Accuracy of abundance estimates

The accuracy of abundance estimates obtained from DFO/DNRE divers was examined using a tag observation experiment. Orange or yellow streamer tags, visible to divers on both sides

and above the salmon, were attached near the posterior edge of the dorsal fin of salmon seined during broodstock collections. Streamer-tagged salmon were released after fork length and sex were recorded. Fish were tagged at Junction (Sept. 3), Kedgwick Forks (Sept. 9), Cooksie (Sept. 29) and Bogan (Oct. 2) pools to estimate tag retention and observe fish movements (Appendix 3).

A smaller proportion of tags were reobserved during snorkelling than during the 1996 study. At best, 48% of large salmon tags and 28% of small salmon tags from the Kedgwick tagging (yellow tags) were reobserved approximately one month after tagging. Very few of the orange tags were reobserved. In 1996, observers of similar experience levels saw approximately 70% of the yellow-tagged fish but very few orange tags. The lower proportions observed this year may be the result of the longer time lag between tagging and snorkelling (approximately 1 month in 1997 vs. approximately two weeks in 1996). This might have resulted in higher tag loss or perhaps the fish had time to move into headwaters or smaller tributaries which we did not snorkel. This result highlights a research need for a controlled experiment to study tag loss.

Fish stayed in the tributaries in which they were tagged and the majority of the reobserved tagged fish had moved upriver. All Junction Pool tags reobserved were in the Little Main Restigouche River.

An experiment on tag loss rates was conducted at the Jacquet River salmon protection barrier. On October 17, 45 orange tags and 42 yellow tags were applied. The pool was snorkelled on October 23, and only 19 orange and 25 yellow tags were observed. A total of 171 fish were observed in the pool, although there were 282 in the pool according to the fence records. Tag retention could therefore be calculated in two different ways:

(1) Tag retention = no. observed/no. applied. By this method, retention of orange tags was 42% and retention of yellow tags was 60%.

(2) Tag retention could be corrected for unobserved fish, assuming the same rate of observation for tagged fish as for total fish in the pool. By this method, corrected retention was 69% for orange tags and 99% for yellow tags.

Tag retention during the first week is therefore probably in the range of: orange (42-69%), yellow (60-99%). Tag retention over longer time periods is not known; a later attempt to snorkel the pool failed due to poor visibility.

Observations during the 1996 and 1997 surveys of the Restigouche support an hypothesis of colour-dependent tag retention: the only tags reobserved in any numbers were the yellow ones. This finding is consistent with snorkeller observations that some of the orange tags retained on salmon are badly damaged and often all that is left is the base of the tag. The yellow tags observed were all intact. The difference in condition of the two tag types probably relates to the different response of salmon to colour. Anglers believe that the colour orange is attractive to salmon and often include this colour when designing salmon flies. It is likely that the behaviour of other salmon is responsible for the observed damage to the orange tags.

Any planned experiment to study loss of the streamer tags should take colour into account. Another factor which should be considered is whether the artificially high density of fish in the barrier pool increased the loss of tags in the experiment.

Recommendation: Continue to evaluate the performance of visual counts by divers. Repeat and expand the tagging experiment to determine whether similar proportions of tagged fish are observed annually and in different river stretches. Expand coverage of diver counts to the whole system. Conduct a controlled experiment to study tag loss rates over a period of one to four weeks. Examine the effects of colour and fish density on tag loss; a different tagging method of equal visibility but with less tag loss could be sought.

3.5 - Spawner surveys (canoe)

Spawner surveys were carried out by DNRE and DFO (Conservation & Protection) personnel in autumn, as close as possible to the time of spawning when fish were observed on gravel bars. Fish were counted in New Brunswick and provincial boundary waters by observers standing in canoes while poling downstream. Areas inaccessible to canoes were walked. Counts provided for Québec waters have been collected as described in section 3.4 since 1992, but were carried out by MEF from canoes in previous years. DNRE collated the data from various sources and provided abundance estimates for each tributary. Redd counts or historical abundance relationships between parts of the system were used by DNRE to estimate spawner abundance in areas not sampled. Barrier fence counts were added to the totals for the Little Main Restigouche and Causapscal rivers. The area above the barrier fence on the Northwest Upsalquitch River was surveyed in 1997 so the barrier fence counts were not included in total counts. Canoe-based surveys were carried out in 1997 in the Upsalquitch, Little Main Restigouche and Main Restigouche rivers. The diver counts described in section 3.4 were used for other portions of the system.

The estimated abundance of spawners in the entire system in 1997 was 5,764 large and 2,280 small salmon (Table 12b).

3.6 - Assessment results

	Large spawners		Small spawners	
	Estimate	% of requirement	Estimate	% of requirement
Conservation requirement	*12,200*		*2,600*	
Diver spawner counts (partial count)	4,677	38	2,733	105
Canoe-based spawner counts	5,764	47	2,280	88
Angling exploitation estimate, ER=0.5-0.3	4,317-7,849	35-64	3,691-8,235	142-317

All assessment methods concluded that large salmon spawning escapement was well below the conservation requirement. Visual assessment methods estimated large salmon abundance within the range bounded by the angling catch-based method, which was 35-64% of the conservation requirement. Given that the diver counts did not cover the entire system, were conducted before all spawners were distributed in the system, and probably did not observe all salmon in the stretches surveyed, it is likely that large salmon spawning escapement was underestimated at 38% of the requirement. Adding canoe-based counts (711 large, 282 small salmon) for the Main Restigouche River (not completely covered by the divers) to the diver counts for tributaries (4,501 large, 2,650 small salmon) yields an estimate of 5,212 large and 2,932 small salmon approximating 43% of the large salmon and 113% of the small salmon conservation requirement, somewhat lower than the estimate of large salmon escapement provided by the canoe-based counts. Spawning escapement of small salmon was estimated lower by the visual methods than by the angling exploitation rate methods, but only the canoe-based counts considered escapement to be less than the conservation requirement. It is likely that this was not an accurate evaluation of small salmon abundance. Small salmon are underestimated from canoes but there is less bias from diver counts (Locke 1997). According to the conservative (because of incomplete spatial coverage) diver counts, small salmon exceeded the conservation requirement.

Using a combination of the visual methods to estimate spawning escapement to be at least 5,200 large and 2,900 small salmon, returns were at least 7,300 large and 6,000 small salmon. Estimated returns by the angling catch-based method were 7,400-11,700 large and 7,900-13,200 small salmon (Tables 8-11). The visual estimate of returns is more conservative since it does not include an adjustment for losses to poaching and disease, which is incorporated in the angling catch-based method.

Returns and spawning escapement of both large and small salmon were mainly lower in 1997 than in 1996, but within the ranges observed in the 1990s (Tables 8-11).

3.7 - Electrofishing

Juvenile salmon were electrofished by DFO at 15 standard sites during July, August and September (Fig. 1). Barrier nets were placed around the perimeter of the site and usually four sweeps of the area were completed. Abundances were calculated by the removal method (Zippin 1956). Densities of juveniles per unit area were determined using site areas measured at the time of sampling. Ninety-five percent confidence intervals of the mean densities were calculated after individual site counts were transformed to natural logarithms. Densities of salmon fry and parr have been estimated at these sites each year since 1972.

Densities of all juvenile age classes were high relative to the five-year mean. Mean densities of 71.3 age 0, 13.9 age 1 and 3.0 age 2 parr per 100 m^2 had increased by 29%, 15% and 7%, respectively, relative to their five-year means (Table 13, Fig. 5).

Thirteen additional sites were fished as "open" sites (i.e., timed stations without barrier nets) in 1997. To calibrate juvenile densities at open sites against the standard sites, a timed 10-minute sweep was made at the standard sites before they were fished by the usual method. Regression analysis then compared the catch per unit effort (CPUE) of the simulated open technique to the total density per 100 m^2 of the standard technique. R^2 values of 0.89 (age 0) and 0.87 (age 1 and 2 combined) were obtained (Fig. 6). In both regressions, the intercepts were not significant at $P<0.05$ but slopes were significant at $P=0.0001$.

Results from the "open" sites will be discussed under the tributary-specific assessments.

4 - Kedgwick River

4.1 - Conservation requirements

The requirement for the Kedgwick River is: 6.89 million eggs, to be obtained from 933 large and 305 small salmon (Table 1).

4.2 - Fishery data

Angling catch in the Kedgwick River in 1997 was 170 large and 295 small salmon (Table 14). Catches of both large and small salmon have been relatively low since about 1990 (Table 15, Fig. 7).

Angling harvest was five large and 267 small salmon (Table 14).

There was no First Nations harvest of salmon recorded on this river in 1997.

4.3 - Adult abundance estimate

Salmon observed in Junction Pool during the snorkelling survey were divided into Little Main Restigouche River (75%) and Kedgwick River (25%) stocks based on subsequent observations of fish tagged in Junction Pool during the 1996 and 1997 surveys. This is a change from past practice in which Junction Pool fish were enumerated with the Kedgwick River stock.

Spawning escapement estimated by snorkellers was 492 large and 215 small salmon (Table 14). Egg production by these fish would have been 3.65 million eggs, or 53% of the conservation egg deposition.

Returns were estimated as 596 large and 484 small salmon (Table 14).

Compared to spawning escapement estimated by the same method in 1994-1996, both large and small salmon numbers were low in 1997 (Table 12a).

4.4 - Juvenile abundances

Mean juvenile densities at eight sites in the Kedgwick River were 90.3 age 0 and 22.1 age 1 and 2 parr per 100 m^2 (Table 16, Fig. 8).

4.5 - Broodstock and stocking

Charlo Salmonid Enhancement Centre (SEC) provided 100,000 eyed eggs and 40,000 feeding fry to MSRT (Management of Salmon in the Restigouche and Tributaries) for stocking in the Kedgwick River. Charlo SEC stocked 141,600 swim up fry and 185,118 age 0 parr directly to the river (Table 17).

A total of 69 large salmon broodstock (39 females, 30 males) were collected for the Charlo SEC at Kedgwick Forks Pool in 1997. These produced 400,069 eggs. Ten additional large salmon were collected, at the same time, as broodstock for an organization in Québec. In addition, 10 of the large salmon broodstock collected from Junction Pool (at the junction of the Kedgwick and Little Main Restigouche rivers) were considered to belong to Kedgwick stock as discussed in section 4.3.

4.6 - Prospects

Spawning escapement to the Kedgwick River in 1997 was poor, not much more than half the required egg deposition. Juvenile salmon abundances in this system appear to be quite high, therefore the prospects for future returns to this river may be reasonably good despite the poor escapement in 1997. A cautious approach to management of the river is recommended.

5 - Little Main Restigouche River

5.1 - Conservation requirements

The conservation egg deposition is 5.38 million eggs, to be obtained from 984 large and 220 small salmon (Table 1).

5.2 - Fishery data

Angling catch in the Little Main Restigouche River in 1997 was 37 large and 130 small salmon (Table 14). Catches have been low in the 1990's (Table 15, Fig. 7). Data are not available prior to 1982 because catches in earlier years were pooled with Main Restigouche River catches.

Angling harvest was 0 large and 115 small salmon (Table 14).

There was no recorded First Nations harvest of salmon on this river.

5.3 - Boston Brook project

In 1997, a collaborative research program based at Boston Brook involved the Atlantic Salmon Federation and J.D. Irving, Ltd. The project consisted of a program intended to optimize salmon production, and included habitat analyses, adult salmon counts at a counting fence, juvenile densities determined by electrofishing, and stocking from a satellite rearing facility.

The counting fence operated from June 17 to October 17, with a period from July 23 to August 12 when counts were incomplete. In total, 132 large and 125 small salmon were counted. The majority (53%) of the fish moved through the fence in October.

5.4 - Adult abundance estimate

As discussed in section 4.3, salmon enumerated in Junction Pool during the snorkelling survey were divided into Little Main Restigouche and Kedgwick stocks.

Spawning escapement was estimated as 846 large and 317 small salmon counted by snorkellers on October 9 (Table 14). Counts by canoeists the following week were 1,183 large and 340 small salmon (Table 12b).

From the more conservative snorkelling count, egg production would have been 4.65 million eggs, or 86% of the conservation requirement (Table 14). Returns to the river were 879 large and 433 small salmon.

5.5 - Juvenile abundances

Juvenile densities estimated by DFO at seven sites were 71.2 age 0 and 14.7 age 1 and 2 parr per 100 m^2 (Table 16, Fig. 8). Mean values at four (main stem) sites sampled by the Irving/ASF project were 41.4 age 0 and 5.8 age 1 and 2 parr per 100 m^2 (Whoriskey et al. 1998).

5.6 - Broodstock and stocking

Broodstock collected from Junction Pool (at the junction of the Little Main Restigouche and Kedgwick rivers) are considered to belong to Little Main Restigouche and Kedgwick stocks as discussed in section 4.3.

In 1997, 100,000 eyed eggs and 20,000 feeding fry from the Little Main Restigouche stock were supplied to MSRT. An additional 72,550 feeding fry were supplied to other satellite rearing sites (Larrys Gulch, Camp Harmony, Watiqua II, Runnymede, Boston Brook). Charlo SEC stocked 201,500 swim up fry and 16,600 age 0 parr directly to the river (Table 17).

In total, 41 (31 Little Main Restigouche stock and 10 Kedgwick stock) large salmon broodstock (21 females, 20 males) were collected and 229,635 eggs were produced.

5.7 - Prospects

The prospects for future salmon returns to the Little Main Restigouche River appear quite good, given that the conservative estimate of egg production in 1997 was 86% of the conservation requirement, and that an estimate based on the canoe-based counts would exceed the conservation requirement. Juvenile densities are also high on this river.

6 - Patapedia River

6.1 - Conservation requirements

Conservation egg deposition for the entire Patapedia River, based on 2.4 eggs/m^2 of accessible habitat, is 3.57 million eggs, to be obtained from 622 large and 131 small salmon (Table 1).

MEF's conservation requirement for the Québec and New Brunswick (main stem) portions of the Patapedia (93% of the total area) is 2.33 million eggs, based on 1.68 eggs/m^2.

6.2 - Fishery data

Angling catch in the Patapedia River in 1997 was 56 large and 73 small salmon (Table 14). Sixty percent of these fish were caught by Québec anglers. Catches have been relatively low in this system since about 1990 (Table 15, Fig. 7).

Angling harvest was 35 large and 73 small salmon (Table 14).

There was no First Nations catch of salmon recorded for the Patapedia River.

6.3 - Adult abundance estimate

Spawning escapement estimated by snorkelling approximately 45 km of the 75 km accessible in the main stem of the Patapedia was 448 large and 150 small salmon (Table 14). The estimated deposition of 2.6 million eggs was 73% of the total requirement for the river at 2.4 eggs/m^2 and provides a conservative estimate of stock status given that only a portion of the main stem was snorkelled. Taking only the main stem into account (1.287×10^6 m^2, which is 87% of the total habitat area), the estimated egg deposition was 84% of requirement.

Returns to the Patapedia River were 484 large and 223 small salmon.

6.4 - Prospects

The large salmon escapement for this river was the lowest since snorkelling counts began in 1994. However, large salmon escapement of each of the previous three years exceeded requirements for the main stem of the Patapedia River. No juvenile densities have been measured in recent years.

7 - Upsalquitch River

7.1 - Conservation requirements

Conservation egg deposition in the Upsalquitch River is estimated as 10.09 million eggs, to be obtained from 1,839 large and 970 small salmon (Table 1).

7.2 - Fishery data

Angling catch in the Upsalquitch was 236 large and 878 small salmon (Table 14). Small salmon catch was higher than the previous two years, although large salmon catch was declining over this time period (Table 15, Fig. 7). Angling catch of small salmon on this river is typically much higher than large salmon. Angling harvest in 1997 was 841 small salmon.

Eel River Bar First Nation reported 11 large and 26 small salmon caught (Table 14). Pabineau First Nation and the N.B. Aboriginal Peoples Council, which also could have fished this river, did not report any catches.

7.3 - Upsalquitch fish barrier

Returns to the barrier fence operated by DNRE at 10 Mile Pool on the Northwest Upsalquitch River (Fig. 1) were 1,027 small and 461 large salmon (Table 18). These returns represent a decrease of 5% relative to the 5-year mean for small salmon, and a decrease of 36% for large salmon. Large salmon comprised 31% of the total run to the fence, compared to 39% on average in the past five years.

7.4 - Estimates of adult abundance

Snorkelling counts of the Northwest Upsalquitch River (below the counting fence) and Main Upsalquitch River, combined with fence counts, estimated 722 large and 1,217 small spawners in this system (Table 14). Egg production was 4.33 million eggs, only 43% of the conservation requirement for the whole system. Excluding the Southeast Upsalquitch system (0.927 x 10^6 m^2, which is 22% of the total habitat area), the conservative estimate of egg deposition was 55% of requirement. Spot-checks of the Southeast Upsalquitch River during the snorkelling counts found relatively few salmon (Appendix 1).

Returns to the system are estimated as 753 large and 2,086 small salmon (Table 14).

7.5 - Electrofishing

Juvenile abundances at 10 sites on the Upsalquitch system were 59.5 age 0 and 18.7 age 1 and 2 parr per 100 m^2 (Table 16, Fig. 8).

7.6 - Broodstock and stocking

In 1997, 5,601 feeding fry were provided to the Boland Brook satellite site. In October, 15,635 age 0 parr were stocked directly to the Upsalquitch River (Table 17).

Only 6 large salmon broodstock (4 females, 2 males) were collected from the Upsalquitch River, for a production of 39,787 eggs.

7.7 - Prospects

Egg production in the Upsalquitch River in 1997 was less than 50% of the recommended conservation level. Large salmon escapement was reduced by 56% relative to the previous two years when snorkelling counts have been conducted in this system. Juvenile abundances at electrofishing sites are reasonably good, but a cautious approach to management of harvests from this river is recommended.

8 - Matapedia River

8.1 - Conservation requirements

The Matapedia is the largest tributary of the Restigouche system (Table 1). Conservation requirements, based on 2.4 eggs/m^2 of accessible habitat, are 16.35 million eggs, to be obtained from 2,395 large and 504 small salmon. Calculated at 1.68 eggs/m^2, the conservation requirement used by MEF is 11.44 million eggs.

8.2 - Fishery data

Angling catch in 1997 was 719 large and 450 small salmon (Table 14). Unlike the other four major tributaries of the Restigouche system, the Matapedia River small salmon catch has shown a fairly steady increase since the early or mid-1980s, concurrent with a steady decrease in large salmon catch (Table 15, Fig. 7). However, catches of both large and small salmon were low in 1997. Angling catch reported here differs slightly from the angling harvest reported in MEF statistics because it includes 30 large salmon hooked and released during the September season extension (R. Firth, CGSMP, pers. comm.). Angling harvest was 689 large and 450 small salmon.

There was no recorded First Nations harvest of salmon on the Matapedia River.

8.3 - Causapscal fish barrier

Returns to Ministère de l'Environnement et de la Faune (MEF)'s barrier fence on the Causapscal River (a tributary of the Matapedia River; Fig. 1) were 2 small salmon and 229 large salmon (Table 18). Large salmon numbers decreased relative to the five-year mean by 38%, similar to the proportional change in large salmon returns to the Upsalquitch barrier fence. Since small salmon are not retained well by the conduit fence, their proportional change is not a valid indicator of abundance at the Causapscal fence.

8.4 - Estimate of adult abundance

Snorkelling estimates of spawning escapement were 1,993 large and 751 small salmon (Table 14). Egg deposition of 13.78 million was 84% of the requirement based on 2.4 eggs/m^2. This egg deposition represents 120% of the requirement based on 1.68 eggs/m^2.

Returns to the river were estimated as 2,684 large and 1,201 small salmon.

8.5 - Prospects

Returns and spawning escapement were reduced in 1997 relative to previous years, and egg deposition did not achieve a level of 2.4 eggs/m^2. The Matapedia River was the only tributary of the Restigouche system in which large salmon returns exceeded the conservation level for spawning. Reductions in spawning escapement in this tributary were less than in most of the other four. Prospects for future returns to this river appear to be good.

9 - Management Considerations

The biological differences in salmon (size, age, potential egg production) from the five major tributaries clearly demonstrate the inappropriateness of managing the Restigouche system as a single unit. Tributary-specific stock characteristics must be taken into account.

None of the five stocks achieved egg deposition at the level of 2.4 eggs/m^2. Egg depositions of the Little Main Restigouche and Matapedia stocks were closest to the conservation level, being estimated as 84-86% of the conservation requirement. Kedgwick, Patapedia and Upsalquitch egg depositions were estimated at 43-73% of the requirement. The condition of the Patapedia stock may be better than is indicated by this estimate because only a portion of the main stem was snorkelled. Taking into account the area of the main stem only, the Patapedia stock was estimated to have produced 84% of its egg requirement. The low estimate for the Upsalquitch stock may also be conservative since very little of the Southeast Upsalquitch River was checked during the snorkelling surveys. Excluding the Southeast Upsalquitch system, the Upsalquitch stock was estimated to have produced 55% of its egg requirement.

Large salmon returns in excess of spawning escapement requirements occurred only in the Matapedia River. Small salmon returns to all the tributaries were in excess of spawning escapement requirements.

Juvenile densities in the Kedgwick, Little Main Restigouche and Upsalquitch rivers all appear to be reasonably good. There w

10 - Research Recommendations

1. Continue tributary-specific assessments of this system.

2. Continue to evaluate the performance of visual counts by divers. Repeat and expand the tagging experiment to determine whether similar proportions of tagged fish are observed annually and in different river stretches. Expand coverage of diver counts to the whole system. Conduct a controlled experiment to study tag loss rates over a period of one to four weeks. Examine the effects of colour and fish density on tag loss. Investigate using a different type of tag.

3. Reliable harvest data from all sources is required for this assessment, regardless of the assessment method selected. The shift in assessment method to diver-based spawner counts has reduced the reliance of the assessment on accurate harvest data, at least to the extent of independently determining spawning escapement. Harvest data is still required to calculate returns. Angling catch and harvest data for this system are considered to be among the most complete in the Maritimes. No harvest data were obtained from three of the five First Nation communities fishing this year; in particular, the catch of Listuguj First Nation probably represents a major component of the total harvest.

4. A conservation requirement for egg deposition in the Main Restigouche River should be developed. This would require collection of biological data for fish that spawn in the main stem, and habitat estimates, taking habitat quality into account.

5. Standardization of interagency approaches to egg deposition (eggs/m^2) requirements for conservation is strongly urged. The appropriateness of the 2.4 eggs/m^2 requirement, currently used by DFO as a default in the absence of river-specific data, should be evaluated, perhaps using electrofishing above barrier fences to determine juvenile survival rates at egg depositions higher than the average for the system.

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Table 1. Biological characteristics, habitat areas and conservation requirements for five major tributaries of the Restigouche River.

(a) Large salmon biological characteristics. Fecundities based on length are calculated using Randall (1984)'s length-fecundity relationship. Sources of information: (1) MEF (angling 1997); (2) Rouleau and Tremblay (1990); (3) DFO (seining and angling 1972-97); (4) DFO (angling 1972-97); (5) Whoriskey et al. 1998 (fence, 1997); (6) DFO (seining 1996-97); (7) Randall (1984) for Restigouche system; (8) DNRE (fence, 1980-92).

Characteristic	Kedgwick	Little Main	Patapedia	Upsalquitch	Matapedia
Mean weight (kg)			6.23		7.41
n (weight)			35		642
Source (weight)			(1)		(1)
Eggs/kg of female			1,535		1,535
Source			(2)		(2)
Mean length (cm)	88.8	80.8		74.5	
n (length)	2039	264		1372	
Source (length)	(3)	(4), (5)		(4)	
Eggs/female	11,184	8,965	9,563	7,413	11,374
% female	66	61	60	74	60
n (% female)	181	from literature	from literature	2224	from literature
Source(% female)	(6)	(7)	(2)	(8)	(2)
Eggs/fish	7,381	5,469	5,738	5,486	6,824

(b) Small salmon biological characteristics. Fecundity calculations and data sources as in part (a).

Characteristic	Kedgwick	Little Main	Patapedia	Upsalquitch	Matapedia
Mean weight (kg)			1.74		2.00
n (weight)			43		356
Source (weight)			(1)		(1)
Eggs/kg of female			2,430		2.430
Source			(2)		(2)
Mean length (cm)	55.4	56.2		53.3	
n (length)	859	238		2443	
Source (length)	(3)	(4), (5)		(4)	
Eggs/female	3,704	3,830	4,228	3,383	4,860
% female	2	2	5	9	5
n (% female)	from literature	from literature	from literature	2514	from literature
Source(% female)	(7)	(7)	(2)	(8)	(2)
Eggs/fish	74	77	211	304	243

(c) Habitat areas and conservation requirements based on 2.4 eggs/m^2 for all tributaries (New Brunswick areas from A. Madden (unpub. data), Québec areas from Pro Faune (1988) and Groupe Salar (1992).

Area (x 10^6 m^2)	Kedgwick	Little Main	Patapedia	Upsalquitch	Matapedia
New Brunswick	2.294	2.243	0.099[a]	4.205	0
Québec	0.578	0	1.387[b]	0	6.811
Total	2.872	2.243	1.486	4.205	6.811
Conservation requirement					
Eggs x10^6	6.89	5.38	3.57	10.09	16.35
Large salmon	933	984	622	1,839	2,395
Small salmon	305	220	131	970	504

a Area is only part (Pollard Bk.) of total New Brunswick area.
b Area is actually total Québec area and remainder (New Brunswick Patapedia main stem) of New Brunswick area.

Table 2. Operating dates of First Nations fisheries in Chaleur Bay and Restigouche River, 1979 to 1997.

Year	New Brunswick		Québec
	Gillnet	Trapnet*	Gillnet
1979	May 14 - Oct 24		Jun 6 - Aug 1
1980	May 19 - Jul 13		Jun 2 - Jul 28
1981	May 15 - Aug 30		
1982	May 17 - Aug 1		Jun 9 - Aug 2
1983	May 16 - Aug 28		Jun 3 - Aug 7
1984	May 14 - Aug 27		Jun 5 - Aug 10
1985	May 20 - Aug 25		Jun 3 - Jul 31
1986	May 19 - Aug 10	May 26 - Jul 20	Jun 2 - Jun 26
1987	May 24 - Jul 27	May 24 - Jul 15	Jun 1 - Jun 30
1988	May 16 - Aug 26	May 16 - Aug 14	Jun 6 - Jul 6
1989	May 15 - Aug 20	May 29 - Aug 20	Jun 5 - Jun 30
1990	May 14 - Jul 22	May 22 - Jul 25	Jun 11 - Jul 6
1991	May 12 - Jul 27	May 26 - Jul 27	Jun 3 - Jun 28
1992	May 25 - Aug 23	May 26 - Aug 2	Jun 10, 11, 12, 16, 17, 25 & 30 Jul 1, 6, 9, 10, 14, 15 & 19
1993	May 17 - Aug 8		May 17 - Aug 8
1994	May 16 - Jul 16		N/A
1995	May 29 - Oct 1		? - Jul 26
1996	Jun 3 - Jul 15		Jun 5 - Jul 21
1997	Jun 16 - Jul 25		Jun 6 - Jul 22

* One trap net in 1986. Two trap nets in 1987 to 1992.

Table 3. Preliminary estimates of harvests (numbers landed) of small and large salmon in Restigouche River, 1997. Harvests of salmon in 1996 are given for comparison.

Fishery	1997		1996		Mean (92-96)		1997 c.f. Mean	
	Small	Large	Small	Large	Small	Large	Small	Large
First Nations*								
N.B.	26	166	77	213	32	314	-19%	-47%
P.Q.	18	985	18	985	-	-	-	-
Angling								
N.B.	2586		2629		2855		-9%	
P.Q.	493	729	755	1001	711	870	-31%	-16%
Total	3123	1880	3479	2199	-	-	-	-

* Québec First Nation harvests (1994 to 1997) are 1989-93 means. Thus, previous five-year means were not calculated in this and subsequent tables that involve First Nations harvests.

Table 4. Estimated angling catches of salmon in the Restigouche River, 1970 to 1997. Estimates of large salmon (1984 to 1997) and small salmon (1996 to 1997) include released fish in New Brunswick. Estimates of large salmon (1997) include released (September) fish in Québec. New Brunswick catch-and-release data were estimates from angling lodge logbooks, crown reserve angler questionnaires and DFO fishery officers. Québec catch-and-release data were estimates from Matapedia/Patapedia River Management Corporation.

	Large			Small			Proportion Large		
Year	PQ	NB	Total	PQ	NB	Total	PQ	NB	Total
1970	326	1716	2042	166	1340	1506	0.66	0.56	0.58
1971	259	757	1016	173	999	1172	0.60	0.43	0.46
1972	1171	3870	5041	111	978	1089	0.91	0.80	0.82
1973	1146	3746	4892	147	1423	1570	0.89	0.72	0.76
1974	1163	4785	5948	129	1038	1167	0.90	0.82	0.84
1975	741	2160	2901	149	1130	1279	0.83	0.66	0.69
1976	1029	4481	5510	377	2345	2722	0.73	0.66	0.67
1977	1579	5128	6707	459	2333	2792	0.77	0.69	0.71
1978	1652	3373	5025	282	1322	1604	0.85	0.72	0.76
1979	826	997	1823	556	1990	2546	0.60	0.33	0.42
1980	2059	4098	6157	409	2833	3242	0.83	0.59	0.66
1981	1408	2832	4240	635	3010	3645	0.69	0.48	0.54
1982	962	1620	2582	402	2449	2851	0.71	0.40	0.48
1983	587	1481	2068	181	715	896	0.76	0.67	0.70
1984	604	1672	2276	314	1474	1788	0.66	0.53	0.56
1985	851	3563	4414	344	3258	3602	0.71	0.52	0.55
1986	1420	4763	6183	502	4915	5417	0.74	0.49	0.53
1987	970	3203	4173	696	4414	5110	0.58	0.42	0.45
1988	1129	4546	5675	789	6084	6873	0.59	0.43	0.45
1989	1162	3441	4603	509	2851	3360	0.70	0.55	0.58
1990	893	2842	3735	765	3559	4324	0.54	0.44	0.46
1991	956	2181	3137	535	1987	2522	0.64	0.52	0.55
1992	1004	3351	4355	752	3999	4751	0.57	0.46	0.48
1993	514	1541	2055	796	2472	3268	0.39	0.38	0.39
1994	963	3016	3979	898	3942	4840	0.52	0.43	0.45
1995	866	1926	2792	354	1235	1589	0.71	0.61	0.64
1996	1001	2822	3823	755	2819	3574	0.57	0.50	0.52
1997	759	1890	2649	493	2915	3408	0.61	0.39	0.44
Mean (92-96)	870	2531	3401	711	2893	3604	0.55	0.48	0.50
1997 c.f. Mean	-13%	-25%	-22%	-31%	+1%	-5%	+11%	-19%	-12%

Table 5. Preliminary estimates of angling catch, effort and CPUE in New Brunswick and Québec portions of the Restigouche River, 1997. Catch, effort and CPUE in 1996 are given for comparison.

		1997			1996			Mean (92-96)			1997 c.f. Mean		
		Catch	Effort	CPUE	Catch	Effort	CPUE	Catch	Effort	CPUE	Catch	Effort	CPUE
N.B.	Small	2915	11090	0.26	2819	10612	0.27	2893	10199	0.28	+1%	+9%	-7%
	Large	1890	11090	0.17	2822	10612	0.27	2531	10199	0.25	-25%	+9%	-32%
P.Q.	Small	493	8324	0.06	755	7686	0.10	711	7360	0.10	-31%	+13%	-40%
	Large	759	8324	0.09	1001	7686	0.13	870	7360	0.12	-13%	+13%	-25%
N.B.+ P.Q.	Small	3408	19414	0.18	3574	18298	0.20	3604	17559	0.21	-5%	+11%	-14%
	Large	2649	19414	0.14	3823	18298	0.21	3401	17559	0.19	-22%	+11%	-26%

[a] Estimates of N.B. small salmon (1996 to 1997) include released fish.
[b] Estimates of N.B. large salmon are released fish.
[c] Estimates of P.Q. large salmon (1997) include released (September) fish.

Table 6. First Nations salmon landings for Chaleur Bay and Restigouche River, 1975 to 1997.

	New Brunswick									Québec[a,b]			
	Estuary			River			Total			Estuary			
Year	Small	Large	Total	Small	Large	Total	Small	Large	Total	Small	Large	Total	Total
1975	3	132	135				3	132	135				135
1976	13	124	137				13	124	137	0	1517	1517	1654
1977	19	212	231				19	212	231	0	2738	2738	2969
1978	23	129	152				23	129	152				152
1979	84	148	232				84	148	232	85	748	833	1065
1980	34	264	298				34	264	298	24	1563	1587	1885
1981	20	211	231				20	211	231				231
1982	12	155	167				12	155	167	148	1521	1669	1836
1983	0	260	260				0	260	260	32	1216	1248	1508
1984	1	213	214				1	213	214	177	1070	1247	1461
1985	0	241	241				0	241	241	35	976	1011	1252
1986	26	431	457				26	431	457	4	1145	1149	1606
1987	95	916	1011				95	916	1011	5	986	991	2002
1988	70	509	579				70	509	579	3	921	924	1503
1989	151	568	719				151	568	719	12	1081	1093	1812
1990	120	471	591				120	471	591	16	1135	1151	1742
1991	10	252	262				10	252	262	9	859	868	1130
1992	2	464	466	0	10	10	2	474	476	53	948	1001	1477
1993	0	293	293	0	8	8	0	301	301	0	901	901	1202
1994	29	348	377	29	32	61	58	380	438	18	985	1003	1441
1995	0	178	178	21	24	45	21	202	223	18	985	1003	1226
1996	0	176	176	77	37	114	77	213	290	18	985	1003	1293
1997	0	155	155	26	11	37	26	166	192	18	985	1003	1195
Mean (92-96)	6	292	298	25	22	48	32	314	346	-	-	-	-
1997 c.f. Mean	-100%	-47%	-48%	+4%	-50%	-23%	-19%	-47%	-45%	-	-	-	-

[a] Québec First Nation landings from (Randall et al. 1988).
[b] Québec First Nation landings (1994 to 1997) are 1989-93 means.

Table 7. Commercial, angling and First Nations salmon landings from Chaleur Bay and Restigouche River, 1970 to 1997.

	Commercial		Angling		First Nations		
Year	Small	Large	Small	Large	Small	Large	Total
1970		18180	1506	2042			21728
1971		8967	1172	1016			11155
1972	36	23	1089	5041			6189
1973	1272	295	1570	4892			8029
1974	132	68	1167	5948			7315
1975	163	1026	1279	2901	3	132	5504
1976	5107	225	2722	5510	13	1641	15218
1977	1134	168	2792	6707	19	2950	13770
1978	1522	156	1604	5025	23	129	8459
1979	83	671	2546	1823	169	896	6188
1980	1986	9	3242	6157	58	1827	13279
1981	3045	3534	3645	4240	20	211	14695
1982	2202	4437	2851	2582	160	1676	13908
1983	1552	4569	896	2068	32	1476	10593
1984	7161	2026	1788	604	178	1283	13040
1985	0	0	3602	851	35	1217	5705
1986	0	0	5417	1420	30	1576	8443
1987	0	0	5110	970	100	1902	8082
1988	0	0	6873	1129	73	1430	9505
1989	0	0	3360	1162	163	1649	6334
1990	0	0	4324	893	136	1606	6959
1991	0	0	2522	956	19	1111	4608
1992	0	0	4751	1004	55	1422	7232
1993	0	0	3268	514	0	1202	4984
1994	0	0	4840	963	76	1365	7244
1995	0	0	1589	866	39	1187	3681
1996	0	0	3384	1001	95	1198	5678
1997	0	0	3079	729	44	1151	5003
Mean (92-96)	0	0	3566	870	-	-	-
1997 c.f. Mean	0%	0%	-14%	-16%	-	-	-

Table 8. Estimated spawners (S) and total returns (R) of large salmon in Restigouche River, 1970 to 1997. Spawners were estimated using an angling exploitation rate (u) of 0.3.

Year	Harvest		Catch Including Releases	Poaching and Disease (PAD)	Spawners (S)	Returns (R)
	Estuary	River[a]				
1970	18180	2042		1297	4765	26284
1971	8967	1016		645	2371	12999
1972	23	5041		3201	11762	20027
1973	295	4892		3106	11415	19708
1974	68	5948		3777	13879	23672
1975	1158	2901		1842	6769	12670
1976	1866	5510		3499	12857	23732
1977	3118	6707		4259	15650	29734
1978	285	5025		3191	11725	20226
1979	1567	1823		1158	4254	8802
1980	1836	6157		3910	14366	26269
1981	3745	4240		2692	9893	20570
1982	6113	2582		1640	6025	16360
1983	6045	2068		1313	4825	14251
1984	3309	722	2276	1445	6865	12341
1985	1217	1173	4414	2803	13540	18733
1986	1576	1695	6183	3926	18915	26112
1987	1902	1170	4173	2650	12740	18462
1988	1430	1329	5675	3604	17588	23951
1989	1649	1492	4603	2923	13851	19915
1990	1606	1146	3735	2372	11304	16428
1991	1111	1181	3137	1992	9276	13560
1992	1412	1337	4355	2765	13180	18694
1993	1194	779	2055	1305	6071	9349
1994	1333	1308	3979	2527	11955	17123
1995	1163	1164	2792	1773	8143	12243
1996	1161	1361	3823	2428	11382	16332
1997	1140	981	2649	1682	7849	11652
Mean (92-96)	-	1190	3401	2160	10146	-
1997 c.f. Mean	-	-18%	-22%	-22%	-23%	-

[a] River harvests (1984 to 1997) may include catch-and-release mortalities and broodstock and First Nations removals.

Table 9. Estimated spawners (S) and total returns (R) of large salmon in Restigouche River, 1970 to 1997. Spawners were estimated using an angling exploitation rate (u) of 0.5.

Year	Harvest		Catch Including Releases	Poaching and Disease (PAD)	Spawners (S)	Returns (R)
	Estuary	River*				
1970	18180	2042		778	2042	23042
1971	8967	1016		387	1016	11386
1972	23	5041		1921	5041	12026
1973	295	4892		1864	4892	11943
1974	68	5948		2266	5948	14230
1975	1158	2901		1105	2901	8065
1976	1866	5510		2099	5510	14985
1977	3118	6707		2555	6707	19087
1978	285	5025		1915	5025	12250
1979	1567	1823		695	1823	5908
1980	1836	6157		2346	6157	16496
1981	3745	4240		1615	4240	13840
1982	6113	2582		984	2582	12261
1983	6045	2068		788	2068	10969
1984	3309	722	2276	867	3830	8728
1985	1217	1173	4414	1682	7655	11727
1986	1576	1695	6183	2356	10671	16298
1987	1902	1170	4173	1590	7176	11838
1988	1430	1329	5675	2162	10021	14942
1989	1649	1492	4603	1754	7714	12609
1990	1606	1146	3735	1423	6324	10499
1991	1111	1181	3137	1195	5093	8580
1992	1412	1337	4355	1659	7373	11781
1993	1194	779	2055	783	3331	6087
1994	1333	1308	3979	1516	6650	10807
1995	1163	1164	2792	1064	4420	7811
1996	1161	1361	3823	1457	6285	10264
1997	1140	981	2649	1009	4317	7447
Mean (92-96)	-	1190	3401	1296	5612	-
1997 c.f. Mean	-	-18%	-22%	-22%	-23%	-

* River harvests (1984 to 1997) may include catch-and-release mortalities and broodstock and First Nations removals.

Table 10. Estimated spawners (S) and total returns (R) of small salmon in Restigouche River, 1970 to 1997. Spawners were estimated using an angling exploitation rate (u) of 0.3.

Year	Harvest		Catch Including Releases	Poaching and Disease (PAD)	Spawners (S)	Returns (R)
	Estuary	River*				
1970	0	1506		817	3514	5837
1971	0	1172		636	2735	4543
1972	36	1089		591	2541	4257
1973	1272	1570		852	3663	7357
1974	132	1167		633	2723	4655
1975	166	1279		694	2984	5123
1976	5120	2722		1477	6351	15670
1977	1153	2792		1515	6515	11975
1978	1545	1604		870	3743	7762
1979	252	2546		1382	5941	10121
1980	2044	3242		1759	7565	14610
1981	3065	3645		1978	8505	17193
1982	2362	2851		1547	6652	13412
1983	1584	896		486	2091	5057
1984	7339	1788		970	4172	14269
1985	35	3602		1955	8405	13997
1986	30	5417		2940	12640	21027
1987	100	5110		2773	11923	19906
1988	73	6873		3730	16037	26713
1989	163	3360		1823	7840	13186
1990	136	4324		2346	10089	16895
1991	19	2522		1369	5885	9795
1992	55	4755	4751	2578	11082	18470
1993	0	3288	3268	1773	7605	12666
1994	47	4869	4840	2627	11264	18807
1995	18	1620	1589	862	3677	6177
1996	18	3475	3574	1939	8438	13870
1997	18	3125	3408	1849	8235	13227
Mean (92-96)	-	3601	3604	1956	8413	-
1997 c.f. Mean	-	-13%	-5%	-5%	-2%	-

* River harvests (1992 to 1997) may include catch-and-release mortalities and broodstock and First Nations removals.

Table 11. Estimated spawners (S) and total returns (R) of small salmon in Restigouche River, 1970 to 1997. Spawners were estimated using an angling exploitation rate (u) of 0.5.

Year	Harvest		Catch Including Releases	Poaching and Disease (PAD)	Spawners (S)	Returns (R)
	Estuary	River*				
1970	0	1506		490	1506	3502
1971	0	1172		382	1172	2726
1972	36	1089		355	1089	2569
1973	1272	1570		511	1570	4923
1974	132	1167		380	1167	2846
1975	166	1279		416	1279	3140
1976	5120	2722		886	2722	11450
1977	1153	2792		909	2792	7646
1978	1545	1604		522	1604	5275
1979	252	2546		829	2546	6173
1980	2044	3242		1056	3242	9584
1981	3065	3645		1187	3645	11542
1982	2362	2851		928	2851	8992
1983	1584	896		292	896	3668
1984	7339	1788		582	1788	11497
1985	35	3602		1173	3602	8412
1986	30	5417		1764	5417	12628
1987	100	5110		1664	5110	11984
1988	73	6873		2238	6873	16057
1989	163	3360		1094	3360	7977
1990	136	4324		1408	4324	10192
1991	19	2522		821	2522	5884
1992	55	4755	4751	1547	4747	11104
1993	0	3288	3268	1064	3248	7600
1994	47	4869	4840	1576	4811	11303
1995	18	1620	1589	517	1558	3713
1996	18	3475	3574	1164	3673	8330
1997	18	3125	3408	1110	3691	7944
Mean (92-96)	-	3601	3604	1174	3607	-
1997 c.f. Mean	-	-13%	-5%	-5%	+2%	-

* River harvests (1992 to 1997) may include catch-and-release mortalities and broodstock and First Nations removals.

Table 12. (a) Pre-spawning salmon counts, primarily by divers, of the Restigouche River system, 1994 to 1997.

	Matapedia		Upsalquitch		Patapedia		Kedgwick		Little Main		Main Restigouche		Restigouche System		Restigouche System
Year*	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small + Large
1994	383	1389	1795	1282	282	670	847	660	685	526	458	1157	4450	5684	10134
1995	669	2461	1497	2002	232	825	447	796	372	523	213	963	3430	7570	11000
1996	1291	2807	-	-	338	777	391	812	158	668	-	-	2178	5064	-
1997	751	1993	1217	722	150	448	215	492	317	846	-	-	2650	4501	-
Mean (94-96)	781	2219	1646	1642	284	757	562	756	405	572	336	1060	-	-	-
1997 c.f. Mean	-4%	-10%	-26%	-56%	-47%	-41%	-62%	-35%	-22%	+48%	-	-	-	-	-

* Count incomplete (1996 to 1997).

(b) Salmon spawner counts, primarily by canoeists, of the Restigouche River system, 1985 to 1997.

	Matapedia		Upsalquitch		Patapedia		Kedgwick		Little Main		Main Restigouche		Restigouche System		Restigouche System
Year*	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small + Large
1985	321	892	925	1174	61	548	108	968	525	1859	343	2342	2283	7783	10066
1986	336	1114	2632	2451	311	728	281	976	1241	2541	413	1708	5214	9518	14732
1987	622	946	1948	2179	80	953	582	1729	610	1418	357	949	4199	8174	12373
1988	791	1243	1761	2140	317	1117	602	1546	536	2128	238	962	4245	9136	13381
1989	764	1834	1387	2223	178	1012	289	1640	923	2442	803	2837	4344	11988	16332
1990	1080	1289	-	-	214	783	-	-	-	-	-	-	-	-	-
1991	640	1152	2247	1575	162	586	423	1204	332	862	453	1713	4257	7092	11349
1992	711	1023	1986	1434	141	502	161	515	200	665	73	565	3272	4704	7976
1993	628	1010	1183	570	98	442	127	370	175	500	141	620	2352	3512	5864
1994	384	1376	1909	1534	282	670	518	1111	611	1192	686	988	4390	6871	11261
1995	669	2461	1263	1578	232	825	83	1244	96	1319	294	877	2637	8304	10941
1996	1291	2807	724	1469	338	777	478	1069	398	1265	262	562	3491	7949	11440
1997	751	1993	542	937	150	448	215	492	340	1183	282	711	2280	5764	8044
Mean (92-96)	737	1735	1413	1317	218	643	273	862	296	988	291	722	3228	6268	9496
1997 c.f. Mean	+2%	+15%	-62%	-29%	-31%	-30%	-21%	-43%	+15%	+20%	-3%	-2%	-29%	-8%	-15%

* Count incomplete (1990). High water prevented field spawner count in New Brunswick.

Table 13. Juvenile densities of Atlantic salmon in the Restigouche River, 1972 to 1997. Juvenile densities (number per $100m^2$) are mean densities of 15 (1972-1990, 1993, 1996 and 1997), 8 (1991), 10 (1992), 11 (1994) and 13 (1995) standard sites, designated by year of spawning.

Spawning Year (i)	Juvenile salmon densities		
	Age 0 (year i+1)	Age 1 (year i+2)	Age 2 (year i+3)
1971	5.2	2.8	0.6
1972	22.0	6.1	1.5
1973	13.1	4.8	1.0
1974	28.6	6.9	1.4
1975	13.3	3.9	1.0
1976	14.7	6.3	1.4
1977	19.5	5.9	2.1
1978	6.1	3.8	0.4
1979	9.3	2.4	0.4
1980	18.9	3.3	3.1
1981	11.2	7.8	2.5
1982	25.4	7.3	1.6
1983	25.1	10.4	2.8
1984	25.2	7.5	4.7
1985	23.9	9.4	2.1
1986	42.0	6.1	1.9
1987	53.2	12.1	3.1
1988	72.1	12.9	2.9
1989	53.2	12.3	2.8
1990	106.5	14.6	4.7
1991	49.6	11.5	2.6
1992	51.4	10.9	2.6
1993	58.5	14.7	1.5
1994	71.9	8.7	3.0
1995	44.1	13.9	-
1996	71.3	-	-
1997	-	-	-
Mean (92-96)	55.1	12.1	2.8
1997 c.f. Mean	+29%	+15%	+7%

Table 14. Estimates of spawning escapement, removals and returns of adult Atlantic salmon to five tributaries of the Restigouche River.

	Kedgwick		Little Main		Patapedia		Upsalquitch		Matapedia	
	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small
Spawners	492	215	846	317	448	150	722	1217	1993	751
Egg deposition (x 10^6)	3.63	0.02	4.63	0.02	2.57	0.03	3.96	0.37	13.60	0.18
Total eggs (x 10^6)	3.65		4.65		2.60		4.33		13.78	
% of requirement	53%		86%		73%		43%		84%	
Angling catch (NB)	165	295	37	130	21	30	236	878	0	0
Angling catch (PQ)	5	0	0	0	35	43	0	0	719	450
Angling catch (total)	170	295	37	130	56	73	236	878	719	450
Angling harvest	5	267	0	115	35	73	0	841	689	450
Hook/release morts.	10	2	2	1	1	0	14	2	2	0
First Nations harvest	0	0	0	0	0	0	11	26	0	0
Broodstock	89	0	31	0	0	0	6	0	0	0
Total removals	104	269	33	116	36	73	31	869	691	450
Returns	596	484	879	433	484	223	753	2086	2684	1201

Table 15. Estimated angling salmon catches from Restigouche River, by tributary, 1970 to 1997. Prior to 1982 Little Main catches included in Main Restigouche. Catches of large salmon (1984 to 1997) and small salmon (1996 to 1997) include released fish in New Brunswick. Catches of large salmon (1997) include released (September) fish in Québec.

	Matapedia		Upsalquitch		Patapedia		Kedgwick		Little Main		Main Restigouche	
Year	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large	Small	Large
1970	162	290	270	122	4	24	323	205			747	1401
1971	153	217	344	90	20	40	128	67			527	602
1972	102	1010	362	984	7	144	165	425			453	2478
1973	147	1098	498	512	0	43	128	548			797	2691
1974	124	1083	433	579	5	63	80	289			525	3934
1975	131	692	462	262	18	31	136	316			532	1600
1976	296	922	767	753	80	88	209	348			1370	3399
1977	278	1312	554	901	181	227	368	684			1411	3583
1978	251	1457	449	507	31	158	143	423			730	2480
1979	466	754	507	135	90	60	316	123			1167	751
1980	311	1784	1178	592	95	229	284	468			1374	3084
1981	485	1176	1234	221	148	175	356	473			1422	2195
1982	259	841	818	214	143	112	322	190	59	50	1250	1175
1983	154	456	203	218	27	103	68	224	14	0	430	1067
1984	285	560	483	346	44	59	149	164	102	27	725	1120
1985	291	807	1175	507	104	84	330	185	163	50	1539	2781
1986	389	1289	1397	630	163	187	566	519	481	155	2421	3403
1987	602	915	819	410	193	77	583	409	407	142	2506	2220
1988	680	1068	1296	659	185	107	807	707	524	74	3381	3060
1989	466	1119	836	515	73	62	208	544	43	31	1734	2332
1990	718	856	905	375	81	45	304	258	152	108	2164	2093
1991	521	940	403	195	30	29	277	403	121	75	1170	1495
1992	693	966	1180	561	122	57	420	320	238	141	2098	2310
1993	735	505	644	221	80	16	231	104	85	42	1493	1167
1994	822	917	1212	508	147	51	455	231	269	106	1935	2166
1995	337	829	307	304	32	71	119	202	32	32	762	1354
1996	721	922	798	311	49	84	268	311	49	42	1689	2153
1997	450	719	878	236	73	56	295	170	130	37	1582	1431
Mean (92-96)	662	828	828	381	86	56	299	234	135	73	1595	1830
1997 c.f. Mean	-32%	-13%	+6%	-38%	-15%	0%	-1%	-27%	-4%	-49%	-1 %	-22%

Table 16. Mean densities of parr at DFO electrofishing sites in the Restigouche River system in 1997.

River	No. of sites	No. of parr/100 m^2 Age 0	Age 1 and 2
Kedgwick	8	90.3	22.1
Little Main Restigouche	7	71.2	14.7
Upsalquitch	10	59.5	18.7
Main Restigouche	3	24.0	18.3

Table 17. Distributions of Atlantic salmon to the Restigouche River system (by system of broodstock origin) by the Charlo Salmonid Enhancement Centre in 1997. Fish were not adipose-clipped or otherwise marked unless noted under Destination.

River	Number	Stage	Destination
Kedgwick	100,000	eyed eggs	MSRT[a] incubation boxes
	141,600	swim up fry	Kedgwick River
	40,000	feeding fry	MSRT[a] satellite site
	185,118	0 parr	Kedgwick River
Little Main	100,000	eyed eggs	MSRT[a] incubation boxes
	201,500	swim up fry	sites on Irving land (L.M. Restigouche R.)
	20,000	feeding fry	MSRT[a] satellite site
	5,000	feeding fry	Larrys Gulch Lodge satellite site (M. Restigouche R.)
	4,500	feeding fry	Camp Harmony Lodge satellite site (M. Upsalquitch R.)
	4,000	feeding fry	Watiqua II Lodge satellite site (M. Upsalquitch R.)
	40,000	feeding fry	Runnymede Lodge satellite site (M. Restigouche R.)
	19,050	feeding fry	Boston Brook Lodge satellite site (L.M. Restigouche R.)
	16,600	0 parr	Little Main Restigouche River
NW. Upsalquitch	5,601	feeding fry	Boland Brook Lodge satellite site (M. Upsalquitch R.)
	15,635	0 parr	Upsalquitch River

[a] Management of Salmon in the Restigouche and tributaries.

Table 18. Counts of salmon at two fish barriers in the Restigouche River system.

Year	Small	Large	Total	Proportion Large	Operating Dates
NW Upsalquitch barrier					
1980	843	887	1730	0.51	Jun. 17 - Oct. 19
1981	789	481	1270	0.38	Jun. 5 - Oct. 29
1982	819	622	1441	0.43	Jun. 4 - Oct. 17
1983	430	301	731	0.41	Jun. 20 - Oct. 30
1984	518	642	1160	0.55	Jun. 8 - Oct. 28
1985	748	517	1265	0.41	Jun. 5 - Oct. 27
1986	1738	1166	2904	0.40	Jun. 6 - Oct. 23
1987	1557	1000	2557	0.39	Jun. 10 - Oct. 29
1988	1121	993	2114	0.47	Jun. 6 - Oct. 25
1989	1051	894	1945	0.46	Jun. 4 - Oct. 22
1990	1324	946	2270	0.42	Jun. 22 - Oct. 14
1991	1267	930	2197	0.42	Jun. 1 - Oct. 16
1992	1351	963	2314	0.42	Jun. 22 - Oct. 22
1993	957	353	1310	0.27	Jun. 27 - Oct. 13
1994	1329	740	2069	0.36	Jun. 26 - Oct. 18
1995	817	946	1763	0.54	Jun. 19 - Oct. 23
1996	959	587	1546	0.38	Jun. 17 - Oct. 23
1997	1027	461	1488	0.31	Jun. 14 - Oct. 22
Mean (92-96)	1083	718	1800	0.39	
1997 c.f. Mean	-5%	-36%	-17%	-21%	
Causapscal barrier					
1988	49	505	554	0.91	Jun. 12 - Sep. 6
1989	7	605	612	0.99	Jun. 18 - Sep. 14
1990	37	456	493	0.92	Jun. 12 - Aug. 14
1991	9	451	460	0.98	Jun. 17 - Aug. 26
1992	8	350	358	0.98	Jun. 12 - Aug. 5
1993	12	256	268	0.96	Jun. 18 - Aug. 17
1994	3	349	352	0.99	Jun. 21 - Sep. 21
1995	1	462	463	1.00	Jun. 12 - Sep. 14
1996	4	441	445	0.99	Jun. 22 - Sep. 20
1997	2	229	231	0.99	Jun. 8 - Sep. 8
Mean (92-96)	6	372	377	0.98	
1997 c.f. Mean	-67%	-38%	-39%	+1%	

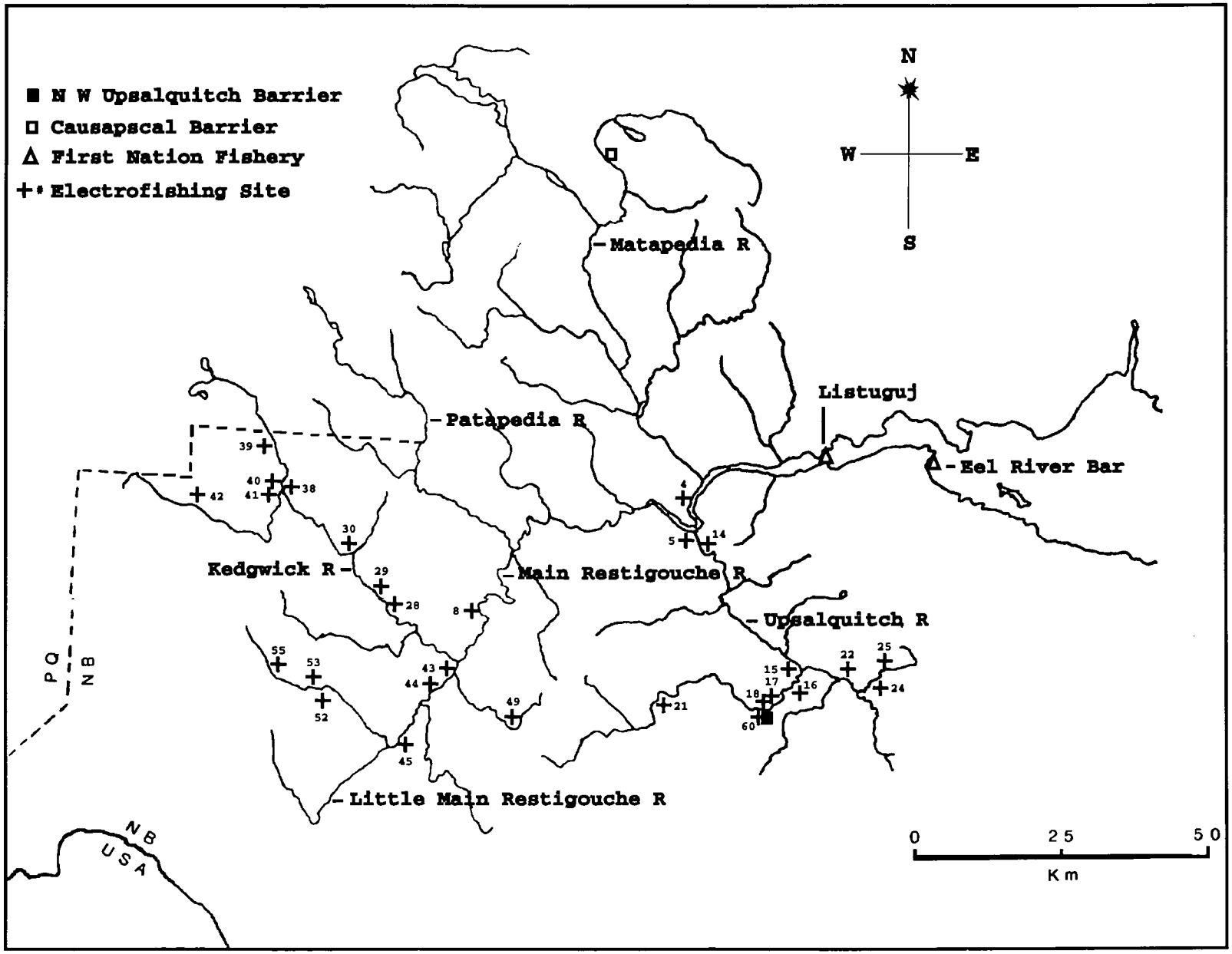

Figure 1. Map of the Restigouche River showing the location of salmon counting facilities, First Nations fisheries and electrofishing sites in 1997.

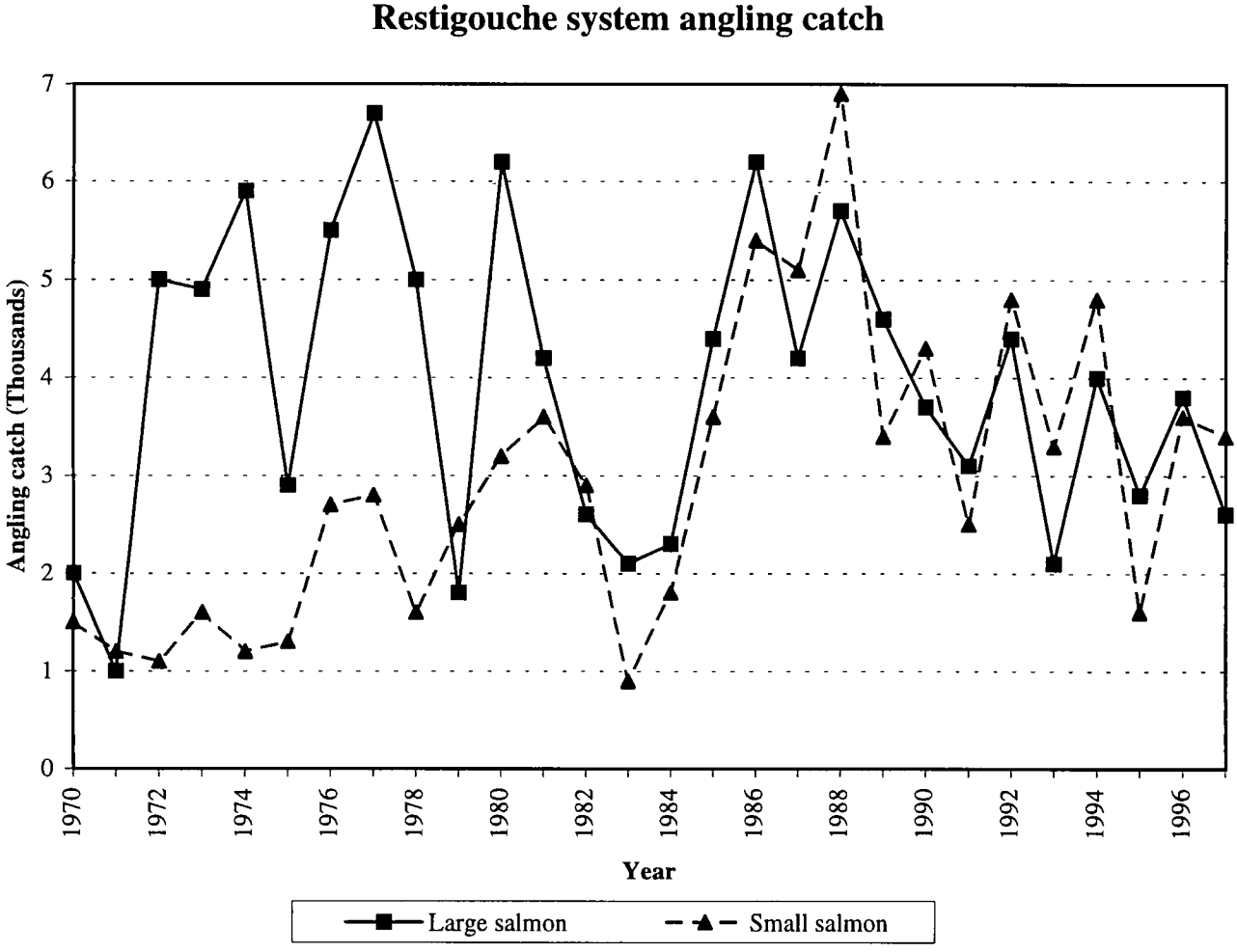

Figure 2. Angling catch of Atlantic salmon in the Restigouche River, 1970 to 1997.

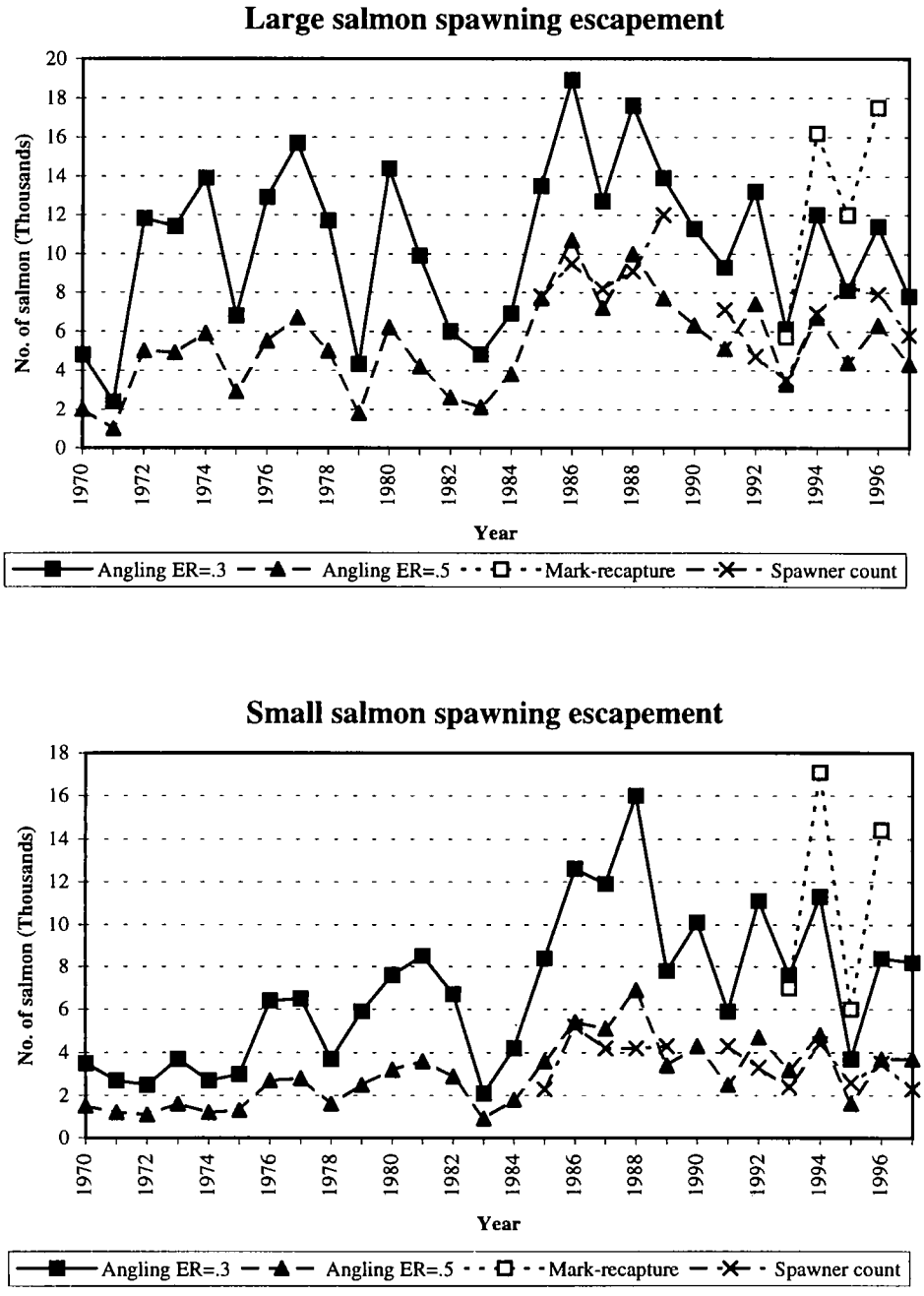

Figure 3. Comparison of large and small salmon spawning escapement estimates by different methods, 1970 to 1997.

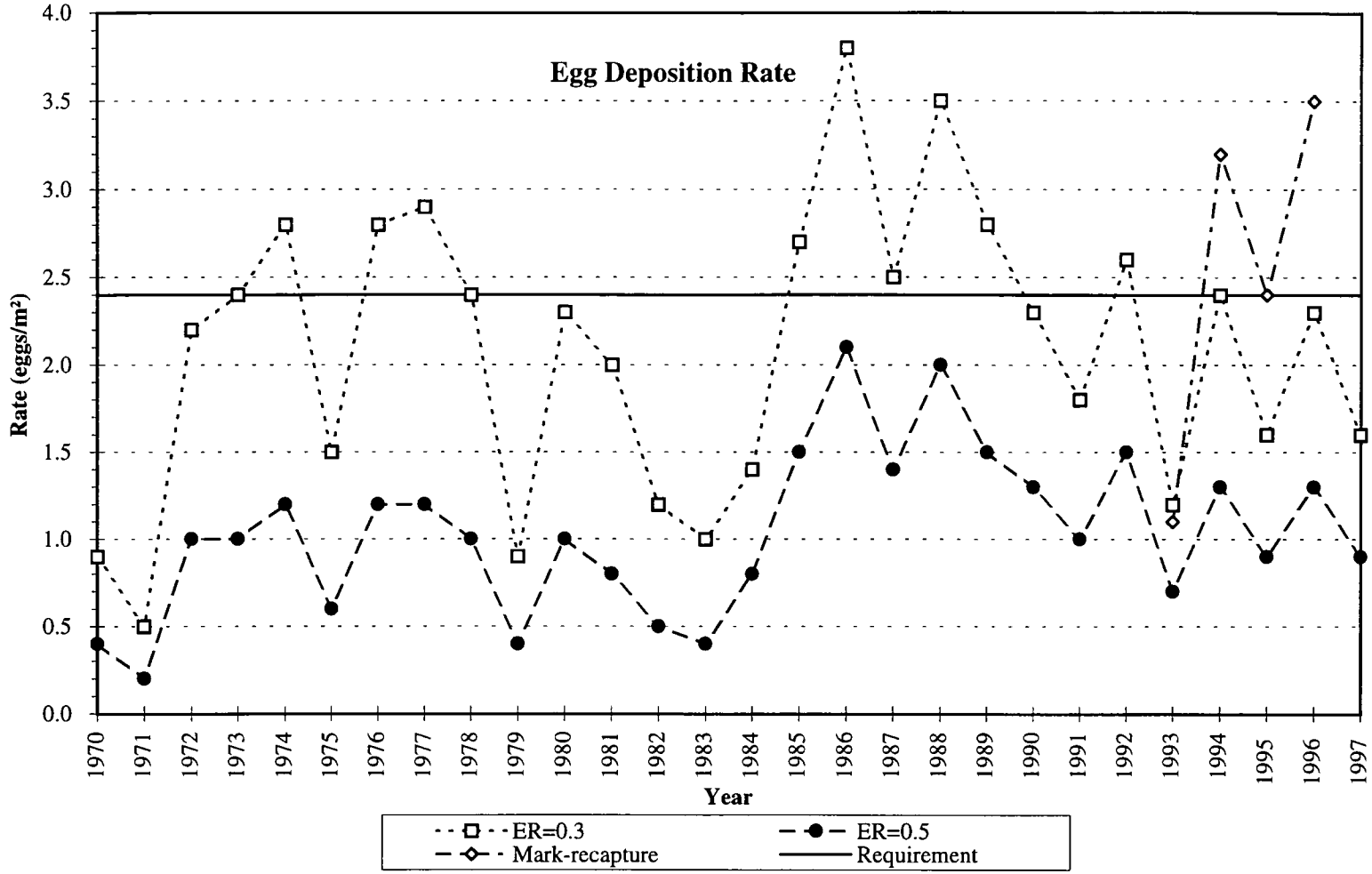

Figure 4. Egg deposition rates of Restigouche River salmon, 1970 to 1997, estimated from angling exploitation rate method (two levels of exploitation rate, ER) and mark -recapture method. Horizontal line indicates conservation requirement deposition rate.

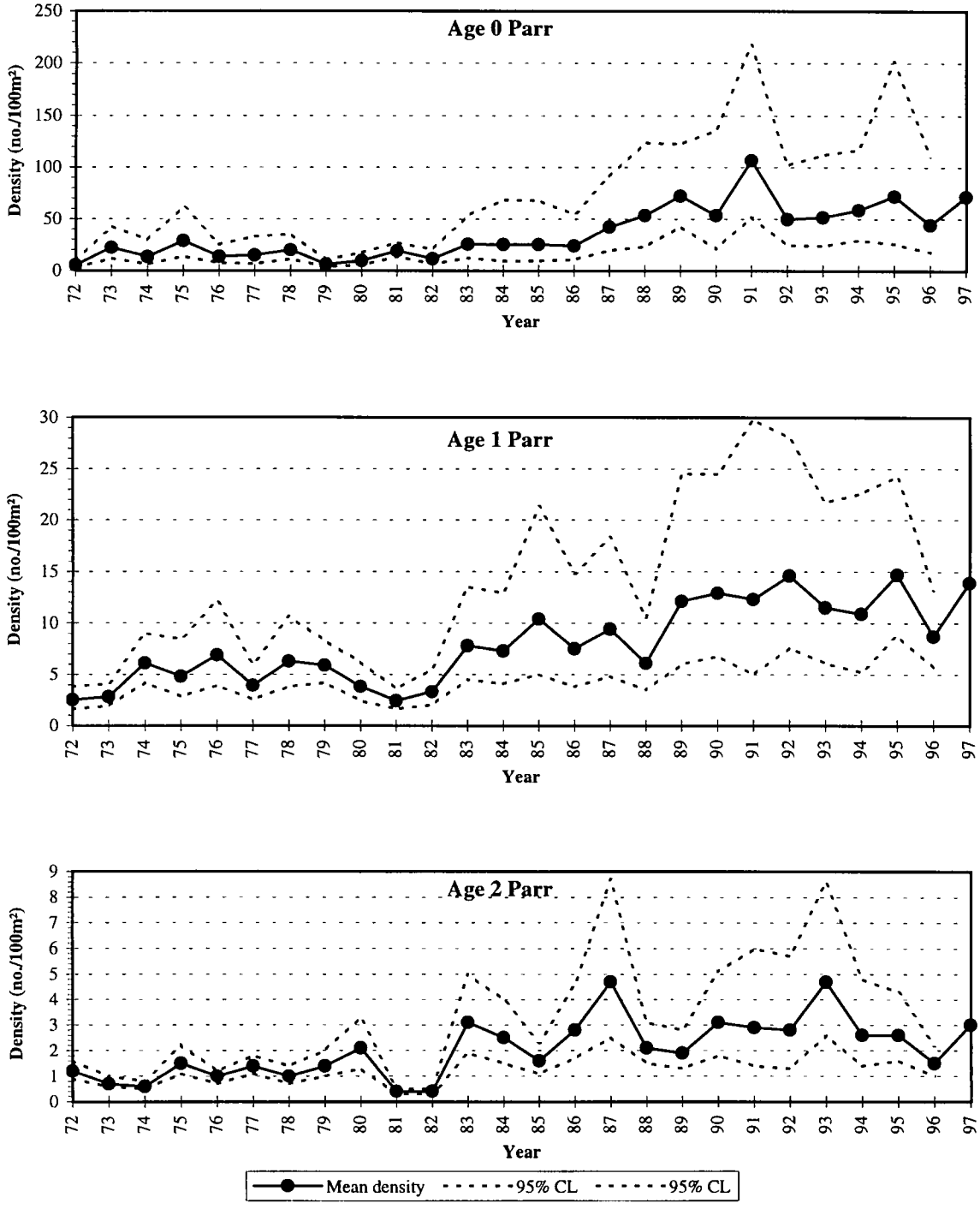

Figure 5. Mean densities of age 0, 1 and 2 parr in the Restigouche River, 1972 to 1997 (15 sites, 1972-1990, 1993, 1996 and 1997; 8 sites, 1991; 10 sites, 1992; 11 sites, 1994 and 13 sites, 1995). Dashed lines are 95% confidence limits.

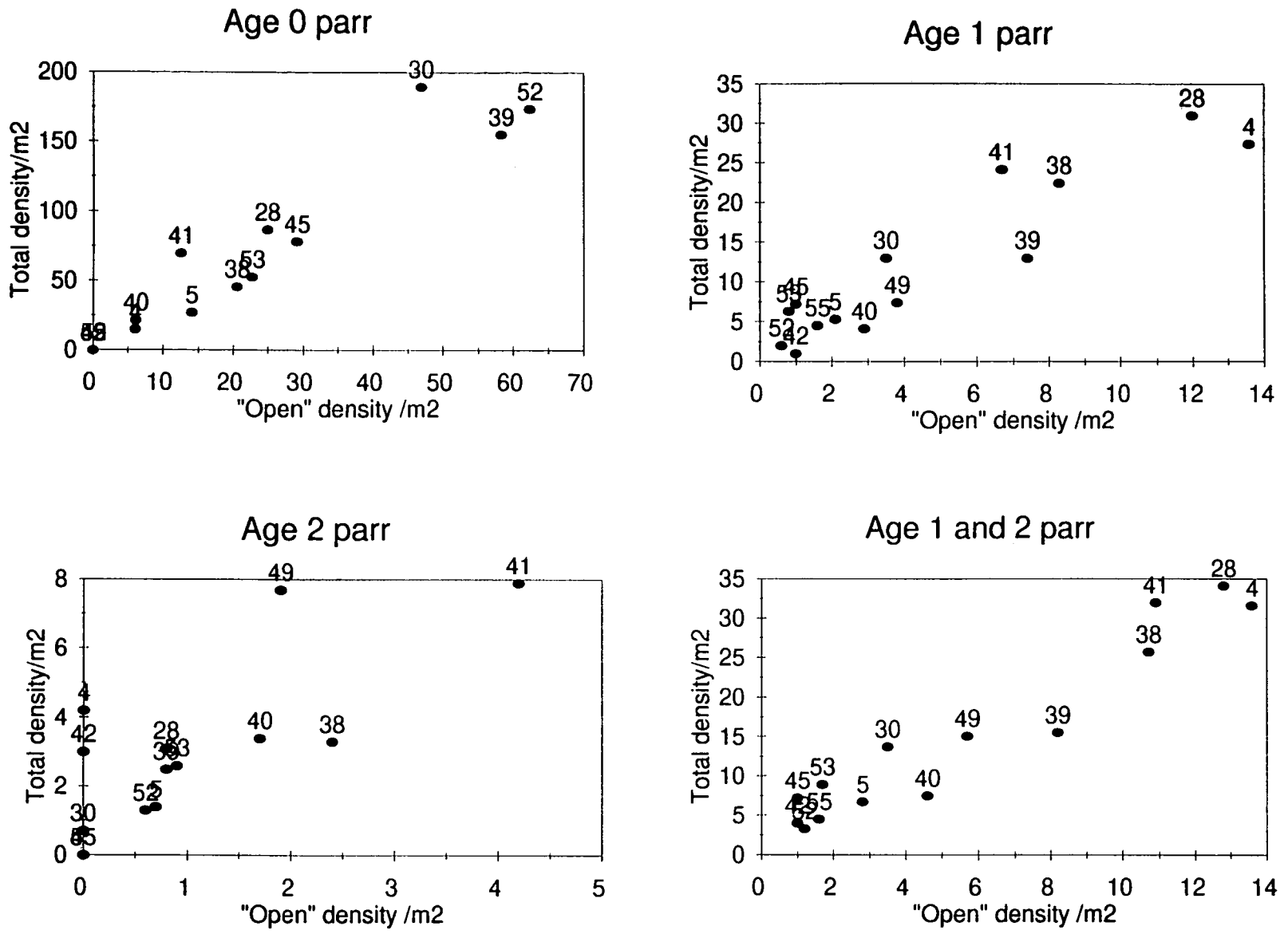

Figure 6. Calibration of the timed "open" electrofishing technique against total densities of parr determined by the Zippin method at 14 standard sites in the Restigouche system.

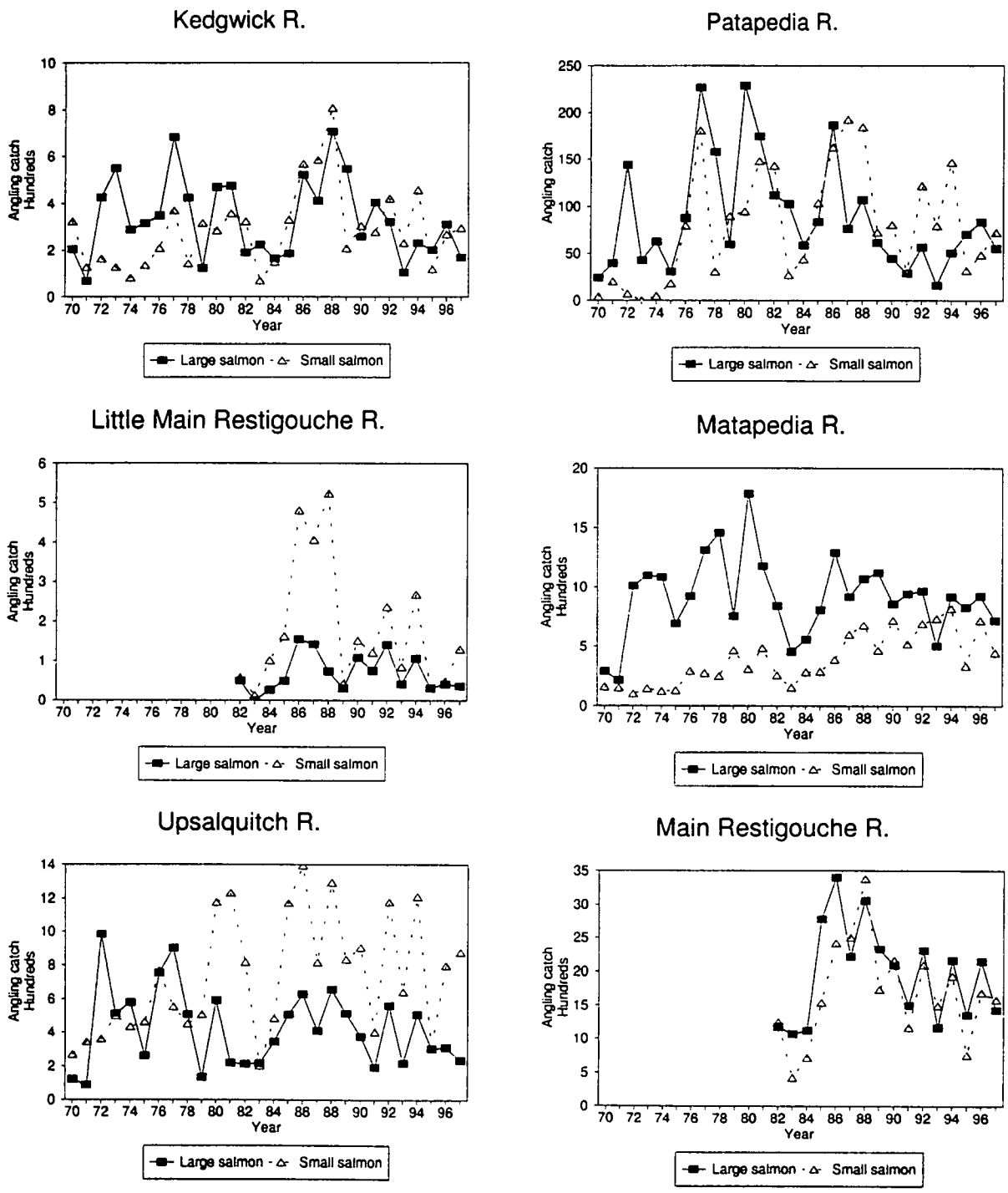

Figure 7. Angling catches of Atlantic salmon in major tributaries of the Restigouche River, 1970 to 1997.

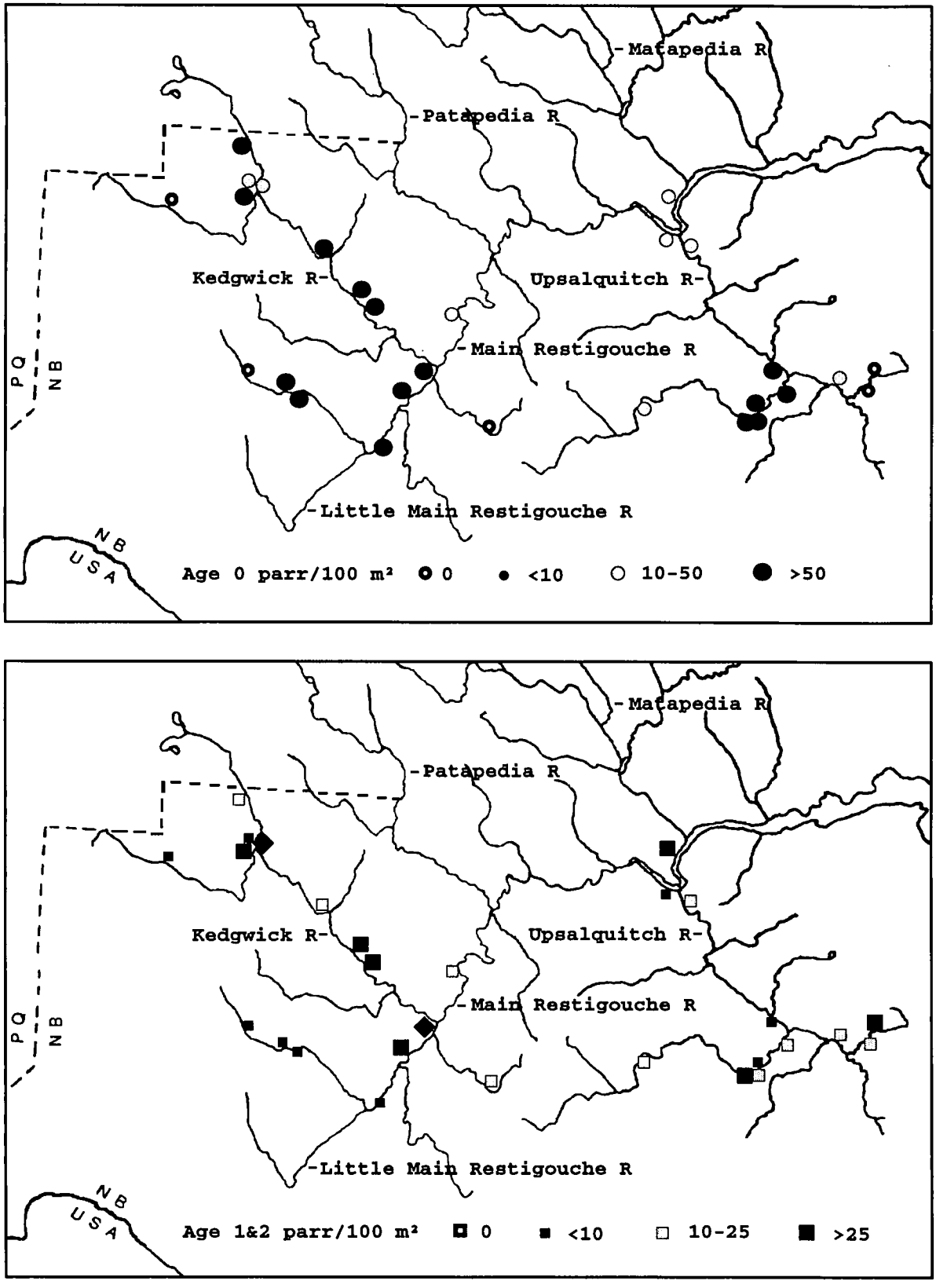

Figure 8. Densities of age 0 and age 1 and 2 parr at electrofishing sites in the Restigouche River in 1997.

Appendix 1.

Summary of snorkeller counts of Atlantic salmon in Restigouche R. Counted Oct. 7-17/97

Kedgwick R. totals - Oct. 7-9/97

Stretch	Salmon			Grilse		
	Untagged	Tagged	Total	Untagged	Tagged	Total
N. Branch (Quig. Bk. to Falaise Pool)	33	1	34	10	0	10
N. Branch (Gin Ck. to mouth)	46	2	48	23	8	31
S. Branch (Union Bk. to mouth)	14	1	15	6	0	6
Kedgwick Forks Pool	87	7	94	42	8	50
Kedgwick Forks to Frasers	68	1	69	31	4	35
Frasers to 15 Mile	38	0	38	20	0	20
15 Mile to 8 Mile	60	1	61	30	0	30
8 Mile to Junction	109	0	109	28	0	28
25% of Junction Pool	24	0	24	5	0	5
TOTAL	**479**	**13**	**492**	**195**	**20**	**215**

Little Main Restigouche R. - Oct. 9

Stretch	Salmon			Grilse		
	Untagged	Tagged	Total	Untagged	Tagged	Total
Boston Bk. to Jardine	328	3	331	42	0	42
Jardine to Junction	373	0	373	151	0	151
75% of Junction Pool	73	0	73	15	0	15
TOTAL	**774**	**3**	**777**	**208**	**0**	**208**
Boston Bk. fence	69	0	69	109	0	109
TOTAL (Little Main Restigouche)	**843**	**3**	**846**	**317**	**0**	**317**

Main Restigouche R. - Oct. 8 & 10

Stretch	Salmon			Grilse		
	Untagged	Tagged	Total	Untagged	Tagged	Total
Below Junction to Downs Gulch (Home)	155	0	155	60	0	60
Mouth of Upsalquitch to Rafting Ground	21	0	21	23	0	23
TOTAL (partial Main Restigouche)	**176**	**0**	**176**	**83**	**0**	**83**

Upsalquitch R. - Oct. 15-17

Stretch	Salmon			Grilse		
	Untagged	Tagged	Total	Untagged	Tagged	Total
Northwest (10 Mile to 3 Mile)	77	0	77	78	0	78
Northwest (3 Mile to Forks)	25	0	25	20	0	20
Upsalquitch Forks Pool	45	1	46	23	0	23
Upsalquitch Forks to Crooked Rapids	82	0	82	41	0	41
Crooked Rapids to Two Brooks	66	0	66	48	1	49
Two Brooks to Upsalquitch Bridge	36	0	36	21	0	21
Upsalquitch Bridge to mouth	44	0	44	22	0	22
TOTAL	**375**	**1**	**376**	**253**	**1**	**254**
10 Mile fence	346	0	346	963	0	963
TOTAL (Upsalquitch)	**721**	**1**	**722**	**1216**	**1**	**1217**

Snorkeller counts of Atlantic salmon in Restigouche system, Oct./97

Kedgwick R.

North Branch, Quigley Brook -> Falaise Pool (P. D'Amours) (Oct. 8)

Pool	Salmon		Grilse		
	Untagged	Tagged	Untagged	Tagged	
TOTAL	**33**	**1**	**10**	**0**	YELLOW tags

North Branch, Gin Creek -> mouth (E. LeBlanc) (Oct. 7)

Pool	Salmon		Grilse		
	Untagged	Tagged	Untagged	Tagged	
Gin Creek	2	0	1	1	YELLOWs
6 mile brook	10	1	3	0	YELLOW
Devil's Elbow	4	0	2	0	
4 mile brook	7	1	3	1	YELLOW
3 mile brook	6	0	1	0	
2 mile brook	5	0	5	4	YELLOW
Falls Gulch	4	0	3	1	YELLOW
Bridge	8	0	5	1	YELLOW
TOTAL	**46**	**2**	**23**	**8**	

South Branch, Union Brook -> mouth (E. LeBlanc) (Oct. 8)

Pool	Salmon		Grilse		
	Untagged	Tagged	Untagged	Tagged	
Hornes Gulch	0	1	0	0	YELLOW
Bains Reef Gulch	0	0	1	0	
Ferguson Berry Gulch	14	0	5	0	
TOTAL	**14**	**1**	**6**	**0**	

Kedgwick R., Kedgwick Forks -> Fraser Lodge (E. LeBlanc) (Oct. 9)

Pool	Salmon		Grilse		
	Untagged	Tagged	Untagged	Tagged	
Kedgwick Forks	87	7	42	8	YELLOW
29 mile	10	0	3	0	
Lower Campbell	3	0	0	0	
Crabtree	13	1	2	0	YELLOW
Clinch	6	0	0	1	YELLOW
States Brook	6	0	0	1	YELLOW
Lower Trout	5	0	5	1	YELLOW
Slough Gundy	7	0	11	0	
Home	18	0	10	1	YELLOW
TOTAL	**155**	**8**	**73**	**12**	

Frasers -> 15 mile (A. Locke, J. MacDonald, G. Thibeault) (Oct. 7 - overcast/sunny breaks; windy)

	Andrea's counts				Julie's counts			
Pool	Salmon		Grilse		Salmon		Grilse	
	Untagged	Tagged	Untagged	Tagged	Untagged	Tagged	Untagged	Tagged
Home	8	0	9	0	8	0	5	0

Bar	4	0	3	0	1	0	0	0
False Alarm	16	0	4	0	4	0	4	0
above Davis	0	0	2	0				
Davis	1	0	2	0				
Black Brook	0	0	0	0				
MacDougal's	0	0	5	0	0	0	1	0
Wyers	0	0	0	0	0	0	0	0
Mac's	0	0	0	0				
Dead Man's	5	0	0	0	0	0	0	0
Underhill	4	0	2	0				
Margery	0	0	0	0				
McKnight's	8	0	2	0	3	0	0	0
Connor's	0	0	0	0	0	0	0	0
TOTAL	**46**	**0**	**29**	**0**	incomplete (didn't swim all pools)			
CONSENSUS	**38**	**0**	**20**	**0**	**used Andrea's counts; exclude Home and Connor's Pools**			

15 mile -> 8 mile (F. Mowbray, T. Miller, D. McBain) (Oct. 7 - overcast/sunny breaks; windy)

	Fran's counts				Tony's counts				
Pool	Salmon		Grilse		Salmon		Grilse		
	Untagged	Tagged	Untagged	Tagged	Untagged	Tagged	Untagged	Tagged	
Connor's	2	0	0	0	5	0	0	0	
15 mile/Ledge	0	0	0	0	0	0	0	0	
Birch Root	0	0	1	0	0	0	1	0	
Dirty	0	0	0	0	0	0	0	0	
Lower	3	0	4	0	0	0	0	0	
14 mile	0	0	0	0	0	0	0	0	
Clay Bank	0	0	0	0	0	0	0	0	
Whalen's	1	0	1	0	4	0	1	0	
Birch Limb	4	0	1	0	4	0	2	0	
12 mile	8	0	4	0	8	0	5	0	
Lower 12 mile	2	0	1	0	2	0	1	0	
11 mile	10	1	10	0	10	0	9	0	YELLOW
Clearwater	0	0	0	0	0	0	0	0	
10 mile	8	0	0	0	7	0	3	0	
Upper 9 mile	0	0	0	0	0	0	2	0	
Brigham's	0	0	0	0	0	0	0	0	
9 mile	22	0	8	0	0	0	0	0	
Lower 9 mile	0	0	0	0	3	0	1	0	
Peter's Brook	0	0	0	0	0	0	0	0	
8 mile	0	0	0	0	0	0	0	0	
Lower 8 mile	0	0	0	0	0	0	0	0	
TOTAL	**60**	**1**	**30**	**0**	**43**	**0**	**25**	**0**	
CONSENSUS	**60**	**1**	**30**	**0**	**use Fran's counts**				

8 mile -> Junction (A. Locke, A. Lavoie, J. Peter-Paul) (Oct. 8 - sunny)

	Andrea's counts				Ann's counts			
Pool	Salmon		Grilse		Salmon		Grilse	
	Untagged	Tagged	Untagged	Tagged	Untagged	Tagged	Untagged	Tagged
7 mile island	17	0	5	0	18	0	4	0
7 mile	1	0	1	0	2	0	0	0

below 7 mile	2	0	0	0	3	0	0	0	
Darlet	7	0	0	0	9	0	0	0	
below Darlet	4	0	0	0	4	0	0	0	
Bowmans Brook	2	0	0	0	2	0	0	0	
Sheas	2	0	0	0	1	0	0	0	
Falls Brook	31	0	6	0	34	0	6	0	
Mistake	5	0	0	0	1	0	0	0	
Deer Lick	0	0	0	0	0	0	0	0	
5 mile	0	0	0	0	0	0	0	0	
4 mile	0	0	0	0	5	0	3	0	
Picard	0	0	0	0	0	0	0	0	
3 mile	11	0	8	0	10	0	6	0	
Home	4	0	4	0	7	0	4	0	
Sundown	0	0	0	0	0	0	0	0	
2 mile	16	0	4	0	17	0	3	0	
1 mile	1	0	2	0	2	0	1	0	
Half mile	0	0	0	0	0	0	0	0	
Junction	110	0	15	0	85	0	25	0	poor visibility
TOTAL	**213**	**0**	**45**	**0**	**200**	**0**	**52**	**0**	

NOTE : Junction Pool mean count was subsequently divided as discussed in section 4.3.

CONSENSUS	**206**	**0**	**48**	**0**	**used mean counts**

Little Main Restigouche

Boston Brook -> Jardine (A. Locke, R. McBain, J. Peter-Paul) (Oct. 9 - overcast; windy)

	Andrea's counts				Junior's counts				
Pool	Salmon		Grilse		Salmon		Grilse		
	Untagged	Tagged	Untagged	Tagged	Untagged	Tagged	Untagged	Tagged	
Boston Brook	250	3	25	0	80	0	0	0	ORANGE tags
#2	0	0	0	0	0	0	0	0	
#3	2	0	1	0	3	0	1	0	
#4	3	0	1	0	0	0	0	0	
#5	0	0	0	0	0	0	0	0	
#6	0	0	0	0	0	0	0	0	
Bobbing Stick	0	0	0	0	0	0	0	0	
#8	15	0	0	0	30	0	10	0	
#9	50	0	10	0	27	0	13	0	
Pothole	0	0	0	0	0	0	0	0	
Fanton Bogan	0	0	0	0	0	0	0	0	
8 mile bogan	0	0	0	0	1	0	0	0	
8 mile	8	0	5	0	1	0	0	0	
Jardine	25	0	6	0	25	0	6	0	
TOTAL	**328**	**3**	**42**	**0**	**142**	**0**	**24**	**0**	

CONSENSUS	**328**	**3**	**42**	**0**	**use Andrea's counts; total excludes Jardine**

Jardine -> Junction (A. Lavoie, T. Miller, F. Mowbray) (Oct. 9 - overcast; windy)

	Ann's counts				Tony's counts			
Pool	Salmon		Grilse		Salmon		Grilse	
	Untagged	Tagged	Untagged	Tagged	Untagged	Tagged	Untagged	Tagged

Jardine	40	0	15	0	48	0	29	0
7 mile/Field	35	0	17	0	30	0	40	0
unnamed (spring)	40	0	15	0	30	0	22	0
Frenchmans	0	0	0	0	0	0	0	0
High Water	0	0	3	0	0	0	3	0
unnamed	0	0	1	0	0	0	1	0
Dark	3	0	3	0	3	0	3	0
4 mile	75	0	35	0	50	0	20	0
Lower 4 mile	0	0	0	0	0	0	0	0
Gravel Pit	0	0	0	0	0	0	0	0
Micmac	11	0	2	0	9	0	5	0
Bogan	5	0	1	0	5	0	3	0
unnamed	65	0	22	0	57	0	30	0
unnamed	7	0	2	0	0	0	1	0
unnamed	35	0	11	0	28	0	12	0
Salmon	9	0	2	0	7	0	5	0
Kanak	23	0	11	0	21	0	8	0
Montgomery	25	0	11	0	32	0	16	0
TOTAL	**373**	**0**	**151**	**0**	**320**	**0**	**198**	**0**
CONSENSUS	**373**	**0**	**151**	**0**	**used Ann's counts**			

Main Restigouche (spot checks only)

Junction ->Down's Gulch (F. Mowbray, T. Miller, R. McBain) (Oct. 8 - sunny; windy)

	Fran's counts				Tony's counts				
Pool	Salmon		Grilse		Salmon		Grilse		
	Untagged	Tagged	Untagged	Tagged	Untagged	Tagged	Untagged	Tagged	
Cow	0	0	0	0	0	0	0	0	
Fence	0	0	0	0	0	0	0	0	
Looking Glass	0	0	0	0	0	0	0	0	
Jimmy's Hole	80	0	50	0	80	0	50	0	poor visibility
Mottatts	0	0	0	0	0	0	0	0	
Jimmy's Pole	0	0	0	0	0	0	0	0	
Flying Eddy	0	0	0	0	0	0	0	0	
Cedar Ledge	2	0	0	0	0	0	0	0	
McKinley	0	0	0	0	0	0	0	0	
Soldier's	33	0	5	0	18	0	7	0	
Cheyne	0	0	0	0	0	0	0	0	
Pool#3	0	0	0	0	0	0	0	0	
Pool#4	6	0	0	0	8	0	1	0	
Pool#5-Larry's Gulch	6	0	0	0	0	0	0	0	
Pancast	0	0	0	0	0	0	0	0	
Lower Little Cross Point	0	0	0	0	0	0	0	0	
unnamed	0	0	0	0	0	0	0	0	
Swallow Bank	19	0	4	0	20	0	5	0	
Down's Gulch	9	0	1	0	8	0	0	0	
TOTAL	**155**	**0**	**60**	**0**	**134**	**0**	**63**	**0**	
CONSENSUS	**155**	**0**	**60**	**0**	**use Fran's counts**				

Mouth of Upsalquitch -> Rafting Ground (A. Locke, A. Lavoie, F. Mowbray) (Oct. 10 - cloudy)

	Andrea's counts				Ann's counts				Fran's counts from canoe	
Pool	Salmon		Grilse		Salmon		Grilse		Salmon	Grilse
	Untagged	Tagged	Untagged	Tagged	Untagged	Tagged	Untagged	Tagged	Untagged	Untagged
Harmony home	0	0	0	0	0	0	0	0	0	0
Long	1	0	0	0	1	0	3	0	1	10
High Rock	21	0	8	0	16	0	12	0	1	1
Rafting Ground	1	0	0	0	0	0	0	0	0	0
TOTAL	**23**	**0**	**8**	**0**	**17**	**0**	**15**	**0**	**2**	**11**
CONSENSUS	**21**	**0**	**23**	**0**	**mean of snorkellers' counts, plus 1 salmon & 11 grilse seen on other side of canoe by Fran**					

Upsalquitch River

Southeast Upsalquitch (from canoe)

Shelter Pool -> Southeast Falls (F. Mowbray, M. Arsenault) (Oct. 15 - sunny)

	Fran's counts			Mike's counts		
Pool	Salmon	Grilse	Unspecified	Salmon	Grilse	Unspecified
Shelter	0	0	0	0	0	0
9 mile	0	0	26	0	0	40
unnamed	0	2	0	0	2	0
unnamed	0	10	0	0	10	0
unnamed	0	4	0	0	4	0
Basket	0	0	10	0	0	12
Flying Eddy	0	0	46	0	0	42
unnamed	0	1	0	0	1	0
unnamed	0	3	0	0	3	0
Jerry F.	0	4	0	0	4	0
Red Rock	0	0	13	0	0	17
Caribou	0	0	18	0	0	18
Shrives	1	4	0	1	4	0
TOTAL			**142**			**158**
CONSENSUS		**total**	**150**	**mean count**		

Northwest Upsalquitch

10 mile -> 3 mile (A. Locke, A. Lavoie, J. Fox) (Oct. 15 - sunny)

	Andrea's counts				Ann's counts			
Pool	Salmon		Grilse		Salmon		Grilse	
	Untagged	Tagged	Untagged	Tagged	Untagged	Tagged	Untagged	Tagged
Upper 9 mile	2	0	0	0	0	0	1	0
unnamed	15	0	6	0	12	0	6	0
unnamed	0	0	0	0	0	0	0	0
Lower 9 mile	5	0	5	0	5	0	5	0
stretch	2	0	4	0	2	0	4	0
8 mile	7	0	6	0	5	0	10	0
7 mile	8	0	18	0	9	0	15	0
unnamed	8	0	5	0	9	0	13	0
unnamed	6	0	12	0	14	0	10	0

unnamed	5	0	3	0	5	0	3	0
6 mile	0	0	0	0	1	0	1	0
unnamed	2	0	2	0	2	0	3	0
unnamed	1	0	2	0	1	0	2	0
5 mile	0	0	1	0	0	0	0	0
unnamed	0	0	0	0	0	0	0	0
4 mile	12	0	3	0	9	0	5	0
unnamed	1	0	3	0	1	0	3	0
3 mile	3	0	2	0	2	0	3	0
TOTAL	**77**	**0**	**72**	**0**	**77**	**0**	**84**	**0**
CONSENSUS	**77**	**0**	**78**	**0**	**mean counts**			

Northwest/Main Upsalquitch

3 mile Northwest -> Crooked Rapids (A. Locke, A. Lavoie, M. Arsenault) (Oct. 16 - overcast/rain; windy)

	Andrea's counts				Ann's counts				
Pool	Salmon		Grilse		Salmon		Grilse		
	Untagged	Tagged	Untagged	Tagged	Untagged	Tagged	Untagged	Tagged	
Lower 3 mile	0	0	0	0	0	0	0	0	
Birch	8	0	2	0	6	0	4	0	
Bear	0	0	0	0	0	0	0	0	
Island	0	0	0	0	0	0	0	0	
unnamed	0	0	0	0	0	0	0	0	
Upper 2 mile	7	0	3	0	4	0	6	0	
Lower 2 mile	3	0	4	0	3	0	4	0	
unnamed	4	0	1	0	4	0	1	0	
Upper 1 mile	0	0	0	0	0	0	0	0	
Lower 1 mile	0	0	0	0	0	0	0	0	
unnamed	1	0	3	0	1	0	3	0	
unnamed	3	0	2	0	2	0	3	0	
Marshall's Hole	2	0	2	0	2	0	2	0	
Forks	45	1	23	0	45	1	23	0	synchro. swim count; ORANGE tags
New	6	0	6	0	5	0	7	0	
Red Reef	0	0	0	0	0	0	0	0	
Upper Red Bank	0	0	0	0	1	0	1	0	
Red Bank Run	0	0	0	0	1	0	3	0	
Red Bank	5	0	1	0	5	0	6	0	
Big Bogan	47	0	15	0	40	0	15	0	
Puncheon	10	0	5	0	14	0	7	0	
Log	0	0	0	0	0	0	0	0	
Cooksie	12	0	6	0	17	0	9	0	
TOTAL	**153**	**1**	**73**	**0**	**150**	**1**	**94**	**0**	
CONSENSUS	**152**	**1**	**84**	**0**	**mean counts**				

Crooked Rapids -> 2 Brooks (A. Madden, K. Ross, F. Mowbray) (Oct. 16 - overcast/rainy; windy)

	Alan's counts				Ken's counts			
Pool	Salmon		Grilse		Salmon		Grilse	
	Untagged	Tagged	Untagged	Tagged	Untagged	Tagged	Untagged	Tagged
Crooked Rapids	0	0	0	0	0	0	0	0

McDougall	4	0	3	0	5	0	3	0	
Island	7	0	4	1	7	0	4	1	synchro. swim count; ORANGE
unnamed	0	0	1	0	0	0	1	0	
Promontory	1	0	5	0	0	0	2	0	
Icehouse	32	0	19	0	32	0	19	0	synchro. swim
Long Lookum	1	0	2	0	0	0	1	0	
Upper Rock	12	0	7	0	12	0	7	0	synchro. swim
Humbug	1	0	3	0	1	0	3	0	
Scott	3	0	2	0	3	0	2	0	
Mond	2	0	1	0	4	0	4	0	
unnamed	0	0	0	0	5	0	4	0	
unnamed	0	0	0	0	1	0	0	0	
Home	0	0	0	0	0	0	0	0	
TOTAL	**63**	**0**	**47**	**1**	**70**	**0**	**50**	**1**	
CONSENSUS	**66**	**0**	**48**	**1**	**mean counts**				

2 Brooks -> Upsalquitch Bridge (A. Locke, F. Mowbray, T. Miller) (Oct. 17 - overcast; rain)

	Andrea's counts			
Pool	Salmon		Grilse	
	Untagged	Tagged	Untagged	Tagged
Ledge Brook	0	0	0	0
Caribou	11	0	5	0
Upper	1	0	1	0
2 mile	13	0	6	0
Little Indian	0	0	0	0
Rocky	0	0	0	0
Boland Brook	0	0	0	0
unnamed	2	0	2	0
unnamed	0	0	1	0
Josie's	0	0	0	0
Frying Pan	0	0	0	0
unnamed	0	0	0	0
Rocky Rapids	0	0	1	0
Waden	1	0	0	0
Ferguson	0	0	1	0
Limestone	0	0	0	0
Elsworth	0	0	0	0
Berry Brook	0	0	0	0
Wharf	1	0	0	0
Noyes	2	0	2	0
unnamed	5	0	2	0
TOTAL	**36**	**0**	**21**	**0**

Upsalquitch Bridge -> mouth of Upsalquitch (A. Lavoie, K. Ross, M. Arsenault) (Oct. 17 - overcast; rain)

	Ann's counts				Ken's counts			
Pool	Salmon		Grilse		Salmon		Grilse	
	Untagged	Tagged	Untagged	Tagged	Untagged	Tagged	Untagged	Tagged
Doubloon	0	0	0	0	3	0	2	0
Jeffrey	0	0	0	0	0	0	0	0
Grog Brook	11	0	6	0	12	0	7	0

Mouloon	12	0	5	0	11	0	6	0
Bogan	0	0	0	0	0	0	0	0
Meadow Brook	0	0	0	0	0	0	0	0
Plum Beach	0	0	0	0	0	0	0	0
Poplar	0	0	0	0	5	0	4	0
Upper Cleveland	3	0	2	0	3	0	0	0
Lower Cleveland	0	0	0	0	0	0	0	0
Cox's	0	0	0	0	3	0	1	0
Flaherty	3	0	2	0	7	0	2	0
Bridge	0	0	0	0	0	0	0	0
Bogan	0	0	0	0	0	0	0	0
Mill Brook	0	0	0	0	0	0	0	0
TOTAL	**29**	**0**	**15**	**0**	**44**	**0**	**22**	**0**
CONSENSUS	**44**	**0**	**22**	**0**	**use Ken's counts**			

Appendix 2. Comparison of diver counts summed over tributary on a case-by-case basis with counts generated using a randomization routine which randomly selects diver 1 or diver 2's count at each pool. Counts obtained from a single diver were added to the randomized data from two-diver teams to obtain total counts for each system. The proportion of the count obtained from non-randomized single-diver reports is indicated.

River	Method	Large salmon count	Small salmon count
Kedgwick	Case-by-case	492	215
	% by single diver	54	64
	Randomization (median,95% confidence limits)	464 (444-494)	205 (195-215)
Little Main Restigouche	Case-by-case	777	208
	% by single diver	0	0
	Randomization (median,95% confidence limits)	740 (690-780)	240 (200-260)
Upsalquitch	Case-by-case	376	254
	% by single diver	10	9
	Randomization (median,95% confidence limits)	345 (330-360)	235 (220-250)

Appendix 3.

Summary of tags applied and observed, Restigouche salmon counts, 1997

River	Tags applied					Tags observed by snorkellers			
	Date	Salmon	Grilse	Colour	Location(s)	Dates	Salmon	Grilse	Location(s)
Little Main	Sept. 3	35	11	orange	Junction	Oct. 9	3 (9%)	0 (0%)	Boston Brook Pool
Kedgwick	Sept. 9	27	72	yellow	Forks	Oct. 7-9	13 (48%)	20 (28%)	Quigley Bk. (N. Branch) &Horne's Gulch (S. Branch) to 11 mile (Main Kedgwick) (82% at and above Forks; 97% at and above Frasers)
Upsalquitch	Sept. 29	12	4	orange	Cooksie	Oct. 15-17	1 (8%)	1 (25%)	Forks & Island Pools
Upsalquitch	Oct. 2	1	0	yellow	Bogan	Oct. 15-17	0 (0%)	0 (0%)	